WILL ENEMY BOMBERS DARKEN OUR SKIES

POPULAR AVIATION

IN THIS ISSUE

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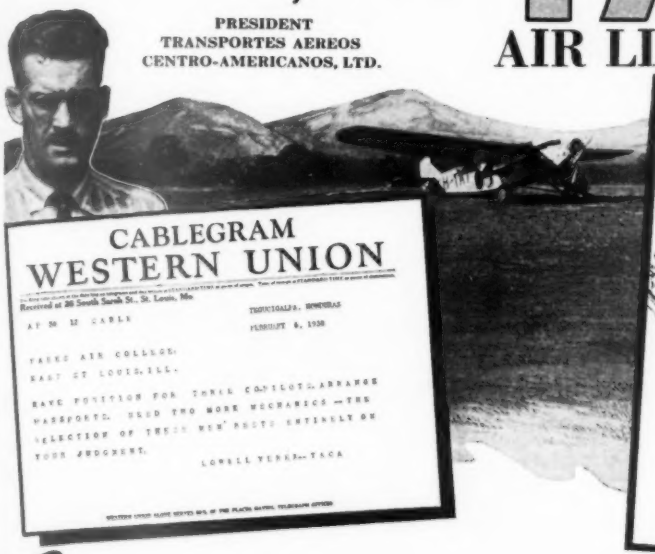

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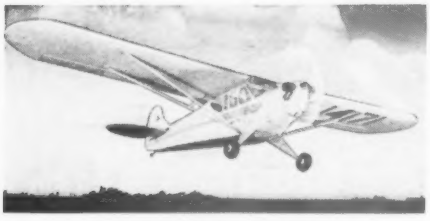

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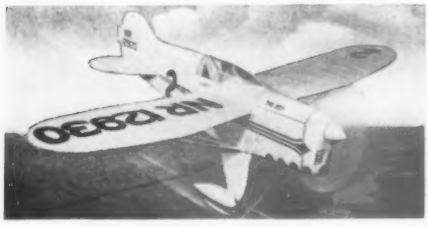

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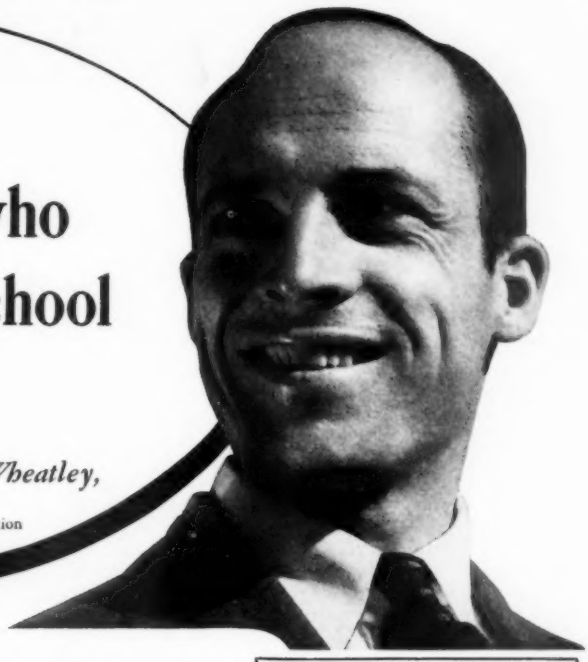
I have real respect for men who have had Boeing School training

— says William B. Wheatley,

Chief Test Pilot,
Consolidated Aircraft Corporation



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(February 1937 — January 1938)

Months	Number Graduated	Number Placements	No. Co.'s Employing Graduates
1937			
Mar.	33	21	11
Apr.	8	16	6
May	1	16	6
June	34	14	8
July	5	7	2
Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	3
1938			
Jan.	7	14	6
Feb.	1	9	7
TOTAL	148	128	28

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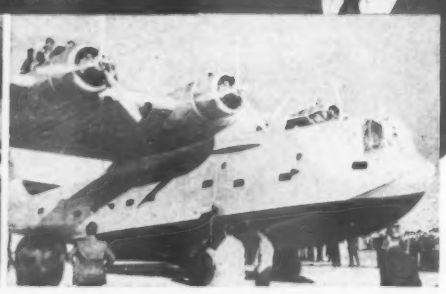

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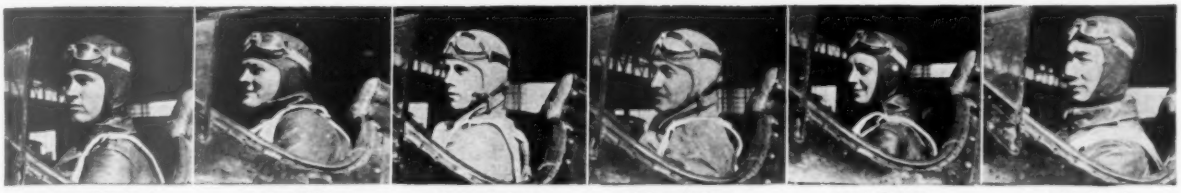
These photographs represent but a few of the present enrollment of the DAWN PATROL. Some of them have come halfway 'round the world to SPARTAN—for like the hundreds of others that pride their membership in the DAWN PATROL these young men KNOW they will leave SPARTAN equipped with the training *that will fit them for ANY JOB IN AVIATION!*



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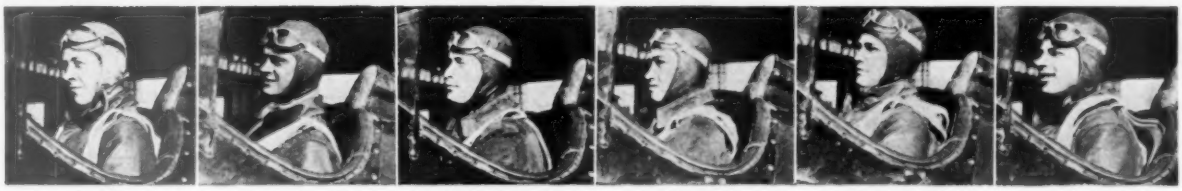
Julio Rodriguez, Santurce, Porta Rico, LIMITED COMMERCIAL
Eddie Canillo, Santa Rosa, Calif., LIMITED COMMERCIAL
Jackson Wing, Canton, China, LIMITED COMMERCIAL
Gentil da Rosa, Portuguese Colony, SPECIAL FLIGHT
Marciano Charpentier, San Jose, Costa Rica, SPECIAL FLIGHT



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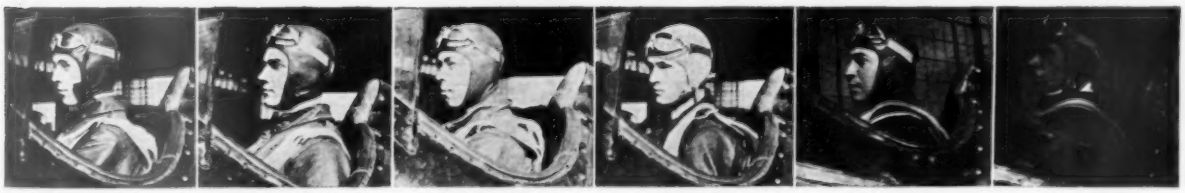

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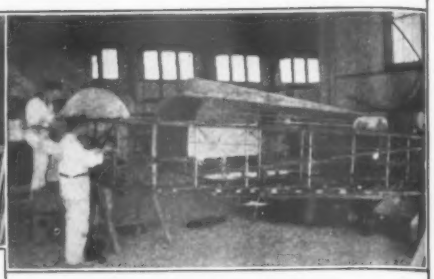

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Dallas Aviation School
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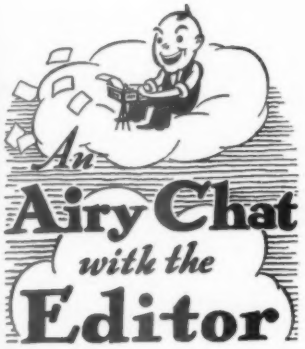
POPULAR AVIATION

Volume XXII JUNE, 1938 Number 6



WHEN railroads were young, rail travel was even more hazardous than present day airline commuting. As recently as the year 1900, spread rails, cracked rails, spread switches and a multitude of other right-of-way disorders reaped their quota of human life.

One common defect of the 1870 era of railroading was the accident due to snake-heads, or the thin light rails that curled up in cold weather and speared the unfortunate passengers seated above them. And then, about every so often, an ambitious engineer fired up his road weary boiler until it went up with a bank, thus contributing still more mortalities to the cause.

Hand brakes failed, draft-bars pulled out or else cracked car axles dumped the whole outfit into a convenient ravine where the victims could be sorted out at leisure. Oh, it was a real adventure to ride the rails in the old days before metallurgists got on the job with the proper metal alloys.

* * *

LOOKING back on a number of transportation developments, including railroading, automobiling, airplaning and sundry other means of conveyance, brings to mind the thought that no form of transportation ever becomes really safe until such time that proper materials are provided for the construction of the carriers. And, now, this time has arrived in commercial aviation so that we can look ahead with full assurance that the metallurgists have the matter well in hand.

Simply improving the design of an airplane, locomotive or automobile is not a sufficient safety measure within itself. Still more important is the stability of the materials employed in the structure.

* * *

BUT—in spite of the strides being made in safety devices for airline

(*Concluded on page 76*)

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The Dunnes flew their ship to Yuma, Arizona, were married, then flew back to Hollywood to celebrate.

The FLYING Dunnes

by WICK EVANS

Mr. and Mrs. James Dunne are air-minded to a fault. In fact, Mr. Dunne wants it known that, once Hollywood goes sour with him, aviation then will become his life work.

A SUDDEN attack of sneezing once saved actor-aviator James Dunne from what might have been a serious, if not fatal, accident.

The incident occurred during the summer of 1937 at Ensenada, Mexico, where Dunne had flown his plane for a short vacation. The landing field at that resort is close to the ocean. So close, as a matter of fact, that most pilots fly several miles out to sea when they wish to gain altitude before attempting to cross the mountain ranges.

Jimmy was no exception. As he began his return flight to Hollywood he flew seaward. That is, he started to fly out over the ocean. He had gone only a short distance when he was seized with a sudden and violent attack of sneezing. Try as he would, he couldn't stop the explosions. The situation grew worse. Violent sneezes are not exactly a part of piloting, and he realized his danger. There was no one with him to take over the controls, so he immediately banked for a landing.

"And it's a good thing, I did," he grinned, when relating the incident. "No sooner had I straightened out to come in than my motor went completely dead. I had to make a forced landing. But if it hadn't been for that bunch of kachoo's that sneaked up on me, the motor would have gone out while several miles from land. Or, even if I had made it back to shore okay, the motor would have conked while returning to Hollywood and believe me, the mountains between Ensenada and Hollywood are no place for a pilot to make a forced landing. I guess I'm just naturally lucky."

I could sympathize fully with Jimmy's belief in luck. Especially when he introduced me to his bride, formerly Frances Gifford, the lovely golden-haired actress he married on Christmas day. "What else but luck would have caused Frances" — pause for a kiss — (his wife, not me) "to marry a mug like me?" he inquired. Since Jimmy is probably the best-liked young actor in Hollywood, I scarcely agree with the "mug" part of his question, but I did agree that he was lucky.

"Tell me about your marriage?" I suggested.

"That's one thing I'll always be willing to talk about," he smiled. "I wish I could make more out of it than there is. The details were very simple. We just got in my plane with a couple of friends, flew to Yuma, were married and came back to Hollywood that evening in time to celebrate. And boy, did we celebrate! I don't think there's a place we missed. I couldn't see any point in spending a quiet evening at home. After all, it isn't every day that a feller gets married. Especially to a girl like Frances."

Photographer Aldo Chiappero and I met Jimmy and his bride at the Municipal Airport. Jimmy's plane, a Stinson *Reliant*, was rolled out on the apron so Aldo could get his pictures. While our friend Mr. Dunne is "watching the birdie"—amid heckling from his wife, before she, too, was roped into the process—let's take a look at his aviation record.

While a number of motion picture stars own and operate their own planes, Dunne is probably the only actor in Hollywood who has made aviation more than a hobby. With him it is infinitely more than a mere pastime. For several reasons.

He knows (and makes no bones about it) that the career of a motion picture star is uncertain at best. He knows that, for reasons outside his control, a star's career may end suddenly. And so he is prepared for such a contingency, even if it never occurs. Here is one way in which he has prepared for the future.

He is currently interested, with Lieutenant Jack Kelly, widely known flyer, in the development of a small plane, powered with a small, economically operated motor, that will cruise at around 150 m.p.h. The plane will have an all-metal cabin, built to seat three persons. It will have a wide wing-spread, and be as near foolproof as possible. One such ship has already been built and the tests were even better than they ex-

(*Continued on page* 80)

The author (left) interviewed Jimmy high over Hollywood in the Dunnes' Stinson.

GUARDSMAN

This newest Coast Guard rescue ship, the Hall PH-2, has a 2,000-mile range, can carry 20 passengers.

On floats, you can "cover" lake resorts.

MAKE YOUR

by RALPH N. MILLER

The owner of this home will be a ready photo-customer.

ALL that keeps many a lightplane unsold is a practical plan for making money with it.

Without reservations, we present such a plan. It has proved out to our critical satisfaction. Perhaps it will to others. We do not say there is a quick fortune in it, but we steadfastly maintain that anyone with average energy and initiative can make the proposition pay for a lightplant within two years. Now that passenger hopping isn't what it used to be, we know of no better way to see the country from the air, meet expenses and even pile up a sizeable stake.

Our answer to the title of this article is aerial photography. Not mapping, nor high priced contract work which is the specialty of established aerial photographic concerns. We mean the "crumb" business which these outfits overlook, or ignore, and which can be rolled into an enviable mound of dough. With their costly equipment, the established companies could not afford to undertake the work. But you, with an inexpensive plane and camera, would deem it coining cash.

Around every community large enough to support an airport there is an amazing number of people who will pay a small sum for decent air pictures, when properly approached. It does not take a master salesman to convince them, only a courteous individual who knows the proper sales talk to apply in each instance. Before listing a number of the opportunities, and appeals, which assay well, let me outline the essential equipment.

First, you need a partner. One of you must be a fairly good flyer. The other must be able to take recognizable air pictures. And, frankly, almost anyone can become a passable aerial photographer with a certain amount of advice and application. Should you prefer to skip the time and expense of learning by the trial-and-error method, enroll in a school of aerial photography. The Department of Commerce lists a dozen of them scattered throughout the country. After a few shots you will note that the art, like flying, becomes more simple as you progress. The photographic outlay may be minimized by picking up a second hand aerial camera, by building one around your own shutter and lens, or by converting a fast newspaper camera. We will pass over most of the technical details, for we aim solely to paint the possibilities. However, be sure to equip your camera with a *f*4.5 or

Sand companies will snap up photographs that show sand positions in the river.

LIGHTPLANE Pay

How many of you fellows with planes have tried earning money with them? Here's a choice idea.

Excellent shots of factories can be made with your lightplane and a cheap camera.

faster lens, for a lightning lens is everything in air shooting. A camera which takes 4 by 5 inch negatives is large enough, but try to get one with at least a 10 inch focal length. This will enable you to blanket a negative with a small estate, for example, without stalling at a dangerously low altitude.

But we will assume that you have familiarized yourself with the fascinating science, and proceed to describe your market. We discovered the possibilities during the dark days of 1932 and 1933. It is still a source of pride that we sold and collected checks for $100 worth of aerial photography during the bank holiday. Yachts were going cheap, with no bidders, at the time.

The success formula of the enterprise is small profits per picture and volume production. There is an enormous margin of profit in photography. Moreover, it costs a fraction of the money and effort to shoot a large number of pictures from a plane than is called for by tedious ground photography. On a 70-mile one hour hop you may easily shoot 25 salable pictures while an earth-bound photographer is getting set up to shoot a single subject. So why try to make a killing with every picture you shoot? It is true that you have something novel and distinctive in every decent picture, but that does not always fire a buying urge.

The main sales hook in selling low-priced aerial photography is bargain appeal. People expect it to be expensive. You startle them into immediate desire with a snap-up price. That is, providing you wield your two main sales hooks. One is pride appeal. The other is a profitable application for an air picture in the buyer's business.

On the first expedition I would shoot the local institutions, the high school, any new point-with-pride buildings, the business district, attractive private estates, every good looking dairy, cemetery and real estate development, small outlying factories and, if available, the sand companies.

Managers of private institutions, such as sanitariums, hospitals, academies, are ready buyers of overhead views of their grounds when you point out that in *your* pictures none of the buildings blanket each other. Help the prospect visualize how well the view will appear in his promotional literature. Remind him that you offer something that doesn't come along every day. Perhaps your man has an older air picture. If so, point to the new buildings which have sprung up since it was shot. Emphasize the need for an up-to-date shot. Often you can peddle views from several angles.

Your high school negative affords two courses of action. Either unload one print, for a goodly sum, to the editors of the school annual, or, what is often more profitable, sell 8 by 10 enlargements to members of the student body at $1 a crack. I have known 20 per cent of the inmates of a small high school to buy prints at this figure.

Likewise, your negative of the business district will find several receptive markets. First, there is the chamber of commerce. Its literature begs for late-model air pictures of the town. Next, it is a good bet that some local advertiser will pay a large price for the negative so as to have something new and striking in calendar illustrations. In small towns it is not hard to sell $1 enlargements to many of the merchants. We have kept a sales crew profitably occupied after shooting a number of "whistle stops".

Aerial views of imposing new buildings go like hot cakes to those firms which have had a hand in its construction. Usually they will number at least 30. The contractor will give you a list of sub-contractors and supply houses.

Why they buy the air pictures, I don't know. Perhaps they serve as a souvenir of a good deal and visual proof of the eminence of the contributing concern. I am convinced, though, that no photograph is so imposing and convincing as a good close-up aerial picture.

To sell sky shots of private estates, play heavily upon pride-appeal. If that isn't enough, suggest that prints would be welcomed by ex-patriate members of the old chateau. Or mention contact prints as novel mounts for the next Christmas cards.

Because most of them issue calendars each year, dairies are usually on the lookout for something new in calendar mounts. You provide it, especially when you have the herds in the picture.

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The author had little difficulty in selling the owner of this farm copies of this shot.

As you read this Uncle Sam's air mail service will be celebrating its 20th birthday. That short span of years, though, belies the American air mail system its true monumental success.

by JOSEPH S. EDGERTON

THE Mail FLIES ON

THE morning of May 14, 1918. In a small room at Hazelhurst Field, New York, assembled a little group of Army officers, all wearing silver wings on their breasts. In France, the final great German drive was in the making. The concern of the men in the little room at Hazelhurst, however, was not with the German death agonies—they were concerned with building for future generations of men a mighty new agency of transportation. They probably did not visualize the matter in just that way at the time; they were concerned with more pressing matters of detail.

Maj. Reuben H. Fleet, in command, delivered a brief and pithy "pep" talk to his pilots, Capts. Torrey H. Webb and Paul Culver and First Lieuts. James C. Edgerton, Stephen Bonsal and Walter Miller. He informed them that their airplanes, with which they were expected to inaugurate the first airmail service on the morrow between New York and Washington, were awaiting them just from the factory—still in their crates!

The immediate problem: to assemble, service, flight test and distribute these airplanes to Philadelphia and Washington before 11 o'clock the next morning, May 15, 1918.

Dismissed, the pilots made a dash for the storage hangar. From a mass of crates each pilot and his crew selected the necessary assortment of fuselage, wing and tail crates. Crate lumber cracked and clattered and out came remodeled JN4H's, the good old Jennies but with a new feature—a mail compartment. They looked good to pilots who had been pushing around 90 h.p. OX-5's.

After hours of intense activity, Captain Culver and Lieutenant Edgerton had their ships assembled, serviced and ready for flight test by 3 p.m. Almost simultaneously, they climbed into the cockpits. Contact! Off went one motor and then the other. Fifteen minutes of warming up and the blocks were kicked away and off they went. A few minutes later Edgerton landed and pronounced No. 38274 ready to go. Culver followed a few minutes later. None of the others was ready to go.

This is Lieut. James C. Edgerton, brother of the author, after the first mail flight.

There was a hurried council of war and Major Fleet, Captain Culver and Lieutenant Edgerton prepared to shove off, the major in a regular Army Jenny,

These Army mail pilots and their DeHavillands were stationed at Reno which was (and still is) a "jumping off" point over the Rockies.

This is an actual photograph of one of the original mailplanes (it's a Jenny) taking off from Washington, D. C., in May of 1918.

to rendezvous at Belmont Park racetrack, the future airmail terminal. The flight was made through a low, broken ceiling. A real war council took place at Belmont, with the airmail inaugural at stake.

The ceiling was dropping and the clouds closing in. About 90 minutes of daylight remained. Impetuous youth prevailed; they took off to meet at Bustleton Field, Philadelphia; a field of which they knew nothing except that it lay 12 miles north of the city.

Culver and Edgerton landed at Bustleton at dusk. Tension increased as time went by and the major's plane was not heard. Finally the hangar telephone rang; Major Fleet was down on a golf links about three miles away with a broken wheel. The two pilots dumped spares into a truck and roared off across the landscape. A spare wheel was installed and, by the lights of a commandeered fleet of automobiles, a good landing was made at Bustleton.

Early on the fateful morning of May 15, Major Fleet ferried to Washington, leaving Culver and Edgerton at Bustleton as relay pilots—the route was to be flown in two sections. The major landed in the Polo Field in East Potomac Park, the Washington airmail terminal, in time for the inaugural take-off, only to find that no one had thought to provide a supply of aviation gasoline. Under the watchful eyes of President Wilson and many dignitaries the starting hour, 11 a. m., came and went to the accompaniment of a wild scramble for gas.

Eventually the fuel arrived, and, a few minutes late, the pilot, Lieutenant George Boyle, took off. Inexperienced and confused, he soon lost his way and, by irony of fate, he landed next door to the farm of Otto Praeger, Second Assistant Postmaster General, in charge of the new airmail, south of Washington!

The first southbound mail left Belmont Park on time and was flown to Bustleton by Captain Webb. His mail was transferred to the mail compartment of Lieutenant Edgerton's No. 38274, on top of that originating from Philadelphia. Lieutenant Edgerton made the 144-mile flight to Washington in 1 hour 36 minutes and landed at the Polo Field at 2:50 p. m. with 5,000 letters, some of them written in New York at 10:30 a. m. They were distributed by Boy Scouts on bicycles. The first regular airmail flight had been completed and a new communications service given to the world. When it became apparent at Bustleton that Boyle was not going to get through, Paul Culver flew on to New York with the northbound Philadelphia mail, making the world's first regular airmail service 75 per cent complete.

The mail of the unfortunate Boyle, contrary to common report, was not sent on by train but was brought back to the Polo Field, Washington. On the morning of May 16, with two days' mail in his cockpit, Lieutenant Edgerton took off for Bustleton and transferred his cargo to Captain Webb, who relayed it to New York. The southbound, however, did not fare so well. Lieutenant Bonsal landed in a South Jersey racetrack, crashing to avoid livestock. His mail was trucked to Bustleton and Lieutenant Miller took off with the combined load late in the afternoon for Washington but soon was forced back with a sputtering motor. Darkness was coming on. Rather than see a failure for the second day, Lieutenant Edgerton took the load and left Bustleton at 6 p. m., arriving over Washington at 8:30, well after dark. Thanks to the foresight of Major Fleet, who had obtained a number of automobiles and placed them strategically around the north end of the tree-enclosed Polo Field, he was able to land safely and the airmail service chalked up a delayed 100 per cent for the second day.

"One of the greatest handicaps experienced by the infant airmail was, strangely enough, psychological," said Lieutenant Edgerton, who was to become first superintendent of flying operations of the airmail service after its transfer from the Army to the Post

One of the greatest weight-carriers of its day was this "Carrier Pigeon" mailplane.

In the evolution of aerial mail carriers, Panagra adopted the "Falcon" on its line.

Before the days of twin-engined transports, Northwest flew the mail with fast Wacos.

This is the air mail of 1938. Today, the modern twin-engined giant airliner always carries mail and express in capacious compartments in the nose and tail.

Office Department. "It may be recalled that weather conditions were treated with the greatest deference during the early war days. For example, the poor and unwary pilot who permitted himself to be caught in the air by a thunderstorm was courting sudden disaster. There were supposed to be mysterious and terrifying down currents which would deposit a pilot on the ground amidst a mass of wreckage whether or no.

"This small group of airmail pilots was therefore instructed by the War Department to sit down on the closest field at the approach of bad weather. I am glad to say that these instructions were gradually and quietly ignored so that before the new service was more than a month old these supposedly terrible weather conditions had been met and largely conquered. Had it not been so the Post Office authorities would have given up the experiment as impracticable."

Another handicap was the lack of suitable landing fields. The Polo Field at Washington was about 1,000 feet long and 400 feet wide, entirely surrounded by towering old shade trees. A covered bandstand stood in the field, 150 feet from one end, the hangar in the other end. On one approach was a city of war barracks, in line with the other, the State, War and Navy buildings. On both sides, water. Planes were brought in by a magnificent process of fishtailing and mechanics became expert in the art of "bulldogging" airplanes about to wind up landing runs in the trees. Poundage was figured on a trial and error basis; if the pilot got out over the bandstand and through the trees, the load was not too heavy; if he didn't, that was an error.

From such humble beginnings came the magnificent air transport system of today. Twenty years—two short decades! From a route of 218 miles the system has expanded to 32,376 miles in the domestic system and 30,450 in the foreign, a total of 62,826 miles.

The original frequency of service was one round trip a day except Sundays. During the first month and a half of service, up to the close of the fiscal year, of the total of 18,000 miles scheduled, 16,009 were actually flown, for a percentage of 84. A total of 713,240 pieces of mail were carried. There were 12 forced landings, six due to mechanical reasons, six to weather, but none resulted in death or injury to personnel.

Armed guards load every airliner that flies the mail. Most valuables are sent by air.

The Post Office Department took over entire operation of the route August 12, 1918, and the first leg of the transcontinental route was established on the first anniversary, May 15, 1918, between Cleveland and Chicago, with a stop at Bryan, Ohio. The second leg, New York to Cleveland, with a stop at Bellefonte, Pa., was established July 1, 1919.

To celebrate the 20th anniversary, the Post Office Department and the airlines are undertaking an elaborate national program. The first pilot to complete a scheduled airmail flight in regular service, Lieutenant Edgerton, now an aeronautical research specialist in the Bureau of Air Commerce, is to be given a prominent role in the official celebration.

An outstanding feature of the national observance of Air Mail Week, May 15-21, will be the commissioning of qualified pilots throughout the country as "airmail pilots for a day" and the establishment of airmail pickup services in every part of the country on May 19. State committees, cooperating with the Post Office Department, will select routes and contributary cities and towns and set up schedules for airmail pickups and flights to main line airmail stops. Postal personnel, in cooperation with air transport lines, aero clubs and similar organizations, Chambers of Commerce and the American Legion, will aid in the organization of what is expected to be the most comprehensive airmail feeder service the world has seen. Use of special local cachets in all parts of the country has been authorized by the Post Office Department, which itself will adopt an official cachet to be used at Kitty Hawk, birthplace of aviation.

The one-day commissions, of course, will be issued only to capable pilots who have approved airplanes and operations will be authorized only from points with airports held by the Bureau of Air Commerce to be adequate.

May 18 is to be "Air Line Cooperation Day," on which the public will be urged to visit air terminals and inspect modern airplanes and equipment.

The National Air Mail Week Committee is headed by Postmaster General Farley, honorary chairman, and Paul R. Younts, executive chairman. Among the members are Second Assistant Postmaster General Harllee Branch and his deputy, James W. Cole; Stephen A. Cisler, general superintendent of the Railway Mail Service; Charles P. Graddick, superintendent of the division of Airmail Service, and state chairmen in each state.

The Post Office Department has inaugurated a nation-wide campaign, to reach its climax during Air Mail Week, to educate American citizens in the use of airmail by showing its progress, dependability, safety and value, and to increase use of the airmail, making possible further expansion of the service.

Governors of all states have been asked to issue appropriate proclamations and newspapers, radio systems, theaters, advertisers and schools have been asked to aid in furthering the campaign. National essay and poster contests for high

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SAFE SANE SURE

by DON GARNETT

This is for you whimpering lads who want to fly "but we can't afford it".

Because C. C. Cullen is a licensed mechanic and a member, he checks Club ships.

THERE'S only one big hurdle in flying for the average man today: Cost.

Flying used to be the rich man's game and it still is—largely. It used to be dangerous, too, but today ships are safe. That is, safe structurally and dynamically and have good engines. It is probably safe to say, too, that the accredited schools without exception offer excellent instruction at a price that is reasonable. But to the young fellow with a minor job, even the least expensive of these is out of the question without several years scrimping and saving. And to the young man with a yen to fly, that's a long time—with the problem of time after solo still a purse-bender. Perhaps progress will find means of lowering these costs progressively, but in the meantime . . .

Out in San Diego in the fall of 1935, a dozen or so young fellows were faced with just this problem. They all wanted to fly—and couldn't afford it. Not by any stretch of the imagination. The Consolidated Aircraft Corporation had just moved its factory there and everybody—young and old—was thinking airplanes. One of the dozen was a flyer with 3,000 hours. He proposed the "club" idea to them and they met in his living room one night to talk it over. This man was Herbert D. Naseef. He had come to San Diego with Consolidated when they moved from Buffalo, and had had experience with one club there. It had been fairly successful and some 16 members had learned to fly. Probably they made a lot of mistakes and costs were higher than they wished, but out of it he had gotten a real knowledge of club problems and at least some of the answers. Naseef explained to them that night just what he knew could be done. He told them that with the long days, week-ends and good weather 20 men could get instruction on one ship; that an hour a week or perhaps a little more was all that any one of them needed—or could pay for. His idea was that the cost of a ship—the lightest and most economical possible to find which would fill the bill—would be divided by the 20 and constitute the price of the 20 memberships. He fixed a price of $3 per hour for his services as instructor, to be paid by the individual student. The cost of ship operation when it was known, would then be added. A top figure of $1,500 was set as the absolute limit for a plane, and within a month the necessary members were pledged.

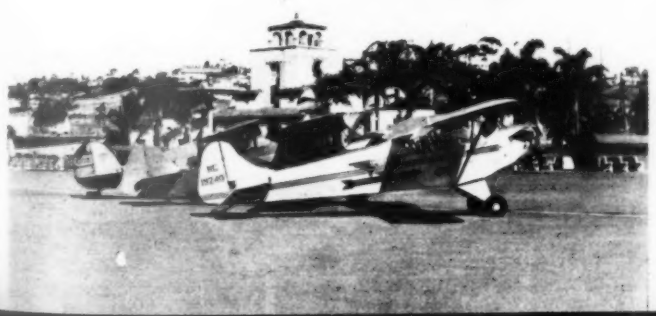
Herbert D. Naseef made this story possible. He heads the novel Club, is a P.A. reader.

But the hard part began there. Nowhere was a plane to be found that was suited to primary training of this sort, for what they could pay. All the big airports and dealers from Santa Barbara south were canvassed without a bit of luck. The young club used good judgment there, though. Until they found exactly what they wanted they weren't going to buy anything. Their plane had to be modern, stable, rugged and, above all, economical.

Two months drifted by repeating the same story. Some of the fellows that had pledged themselves were getting restless and wanted action. Up to this time no actual cash had been put up other than "chipping in" for committee expenses while trying to find a plane. This hadn't amounted to much but it was several dollars. So one night they met and it was decided to take one more trip to Los Angeles and do or die. It looked like die, too, till about sundown on the way home the committee stumbled into the Air Associates hangar at the Long Beach Municipal Airport. And there she was! A nearly new Piper *Cub*. After a couple of hours talk, a deal was made that was to cost the club a little more than $1,200 net. This also included one year's financing charges for a contract sale deal which really proved to be a life saver to the club for when the com-

(*Continued on page 90*)

From a second-hand Cub, the San Diego Flying Club has expanded to the new Cub, Taylorcraft and Porterfield shown below.



Below are the Club officers: (left to right) J. H. Baker, E. E. Birch, Naseef, Carl Hunneman, Orville Hubbard and A. L. Griffiths.

WILL ENEMY BOMBERS

By HARRISON FORMAN

Famed explorer, traveler, lecturer, writer and photographer.

Need Americans fear a sudden air attack? Are the United States geographically protected from an aerial menace?

FOR some time, now, the jittery nations of Europe have been engaged in a headlong armament race in preparation for the "next World War."

With mutual suspicions and brooding jealousies, combined with geographical proximities, serving to keep the European air filled with political fireworks, a single injudicious word here, or misinterpreted action there, may easily be the necessary spark to touch off the explosion.

Apprehensively the Frenchman scans the skies, knowing very well that, despite his "impregnable" line of forts and day-and-night patrol along the Rhine, *any point in France can be easily bombed in a mere two hours' flight from "somewhere-in-Germany."*

And that the Briton also recognizes this imminent danger is well attested by Stanley Baldwin's recent announcement that "Britain's political border is henceforth the Rhine." Italy, Czechoslovakia, Poland, the Balkans, as well as Germany herself, have this same ever-present feeling of insecurity.

And so there are gas-mask drills in France, realistic air attack shows in Germany, and whistling-in-the-dark "mobilization exercises" in Italy to impress Mr. Civilian European of the imminent danger from his neighboring "Big Bad Wolves."

In America, alarmists bewail our defenselessness, and paint awful word-pictures of "vast horde of enemy bombers darkening our skies, spreading horrible death and destruction over the land." Accusations are hurled indiscriminately at "doddering admirals," "traitorous pacifists" and "weak-kneed diplomatists." And timid impressionable Mr. Man-in-the-Street pretty soon begins to worry and wonder why "something isn't done about it."

Well, just what is the extent of our national security? There are three mediums of attack in modern warfare; namely: by air, by land, and by sea.

Aircraft as instruments of war have shrunken the frontiers of Europe—though at the same time they have expanded the frontiers of the United States. We have no two-hour-flight-distant Germanies, Frances or Italies directly adjacent to our borders. Canada and Mexico, of course, present no military threat.

Our borders, therefore, are more than 3,000 miles distant from our Atlantic and 6,000 miles from our Pacific shores. It is quite apparent (as well proven in recent trans-oceanic flights) that if a warplane must fly three to six thousand miles before it reaches its objective, it must carry quite a sizable quantity of gasoline—at the expense of its bomb-carrying capacity.

To transport a "vast horde of bombers" on the decks of aircraft carriers, to bring them close enough to our shores so that they may carry bombs instead of gasoline, is, of course, impracticable and foolhardy to the extreme.

To begin with, the United States has a combined Naval and Army air force of

Most prevalent American fear is an air attack on great metropolitan centers like this.

DARKEN OUR SKIES ?

Stealthy bombers like these, though deadly, never could fly to U.S. shores.

2,000 or more fighting planes—not to mention more than 10,000 civil aircraft, most of which can, in a matter of hours, be converted into some military use. A "vast horde" of the enemy must, therefore, certainly be reckoned in the many thousands to be of real danger. And since a single modern aircraft carrier will accommodate less than a hundred bombing planes, it would take quite an armada of aircraft carriers—*more than are known to exist in the combined navies of the world*—to transport this "vast horde" to our shores.

But, suppose a nation could quickly convert some of her present ships to serve as carriers. There still remains the question of their protection. We should need only to send a squadron of submarines and fast cruisers with a few planes to meet the carrier-armada in mid-ocean and torpedo them with their broods of warplanes.

Sinking would hardly be necessary. A single shell bursting on the deck of an enemy carrier would not only prevent its undamaged planes from taking off but also prevent the return of any of its complement of planes which have already taken the air—stranding them in mid-ocean several thousand miles from our shores, with only the waves and certain destruction awaiting the exhaustion of their fuel supply.

A single shell, torpedo or bomb renders a whole carrier useless and puts a hundred planes out of commission—a risk far too great for the enemy to chance. It is obvious, therefore, that to base and transport the "vast horde" on a fleet of carriers, unless escorted by a powerful navy (which contingency falls into the category of a sea attack—to be considered presently) is out of the question.

But, just for the sake of argument, let us suppose that an enemy does possess an air force of bombers capable of carrying both a sufficient amount of gasoline [illegible] several thousand mile flight and enough bombs to still function as a destructive offensive weapon. This is a big country; and even were we to be caught entirely off our guard, and the "vast horde" of the enemy are enabled to approach and drop their deadly burden of bombs before a single American plane or anti-aircraft gun could be manned to offer resistance or hindrance, the "horrible death and destruction" the enemy bombers could spread would have to be of considerable proportions to completely prostrate the country—an obvious impossibility.

Moreover, for the enemy bombers to have successfully accomplished their mission of a devastating surprise attack on our Atlantic or Pacific coasts is one thing; to hold in subjection these coasts is quite another matter. The "vast horde"—no matter what terror they may have inspired during the attack—once they have "laid their eggs" are rendered as helpless and as useless as a battery of giant artillery without shells to fire.

To be sure, the destruction of a city such as New York or San Francisco might have a serious effect upon the morale of our people. Still, there is just as much possibility, if not more, that such a catastrophe might act as a boomerang, and result in a stirring up of the American people in a united and grimly determined front against the aggressor.

In direct contrast to the heavily fortified borders of the European countries we have more than 3,000 miles along our northern and a thousand miles along our southern borders entirely unprotected from a military standpoint. There are no fortresses, big guns or large troop dispositions along our Canadian and Mexican borders. At the same time there is no fear or danger of a serious attack by a large force of arms from either our neighbors to the north or to the south.

An army sent against us from abroad would have to be of considerable proportions to attack and defeat our land forces, and occupy the country. This army would, of necessity, require a large fleet of transports convoyed by a sizable navy comparing at least favorably in formidability with our own.

This immediately precludes the danger of an attack from even such first-rate World Powers as France, Italy or Germany. In fact, as long as we maintain the present ratio of world naval strengths—and we can do that easily enough by our financial capacity to outbuild any ambitious Power—we can have cause to fear an attack on our shores by only two nations in the world today: Great Britain and Japan.

Through the Office of Naval Intelligence, world-wide in its scope, and in cooperation with our State Department, our Navy Department keeps itself well posted with the tenor and trend of international politics. For the present there is very little likelihood of a political break with Great Britain. Nor is there any probability of England's joining forces with Japan or any other nation to attack us. It is for this reason that those-in-the-know have four years ago ordered our combined fleets to Pacific waters.

Let us, then, consider the possibility of secret Japanese preparations for a major attack upon our shores. Our Navy would, of course, be well informed of the imminence of this venture many days, perhaps weeks, in advance. Such large-scale mobilization movements could hardly escape the observance of our Intelligence agents.

Immediately, the machinery of defense would be set into action. A squadron of submarines would be ordered to the Japanese coast to watch for the emergence of the enemy expeditionary force. The

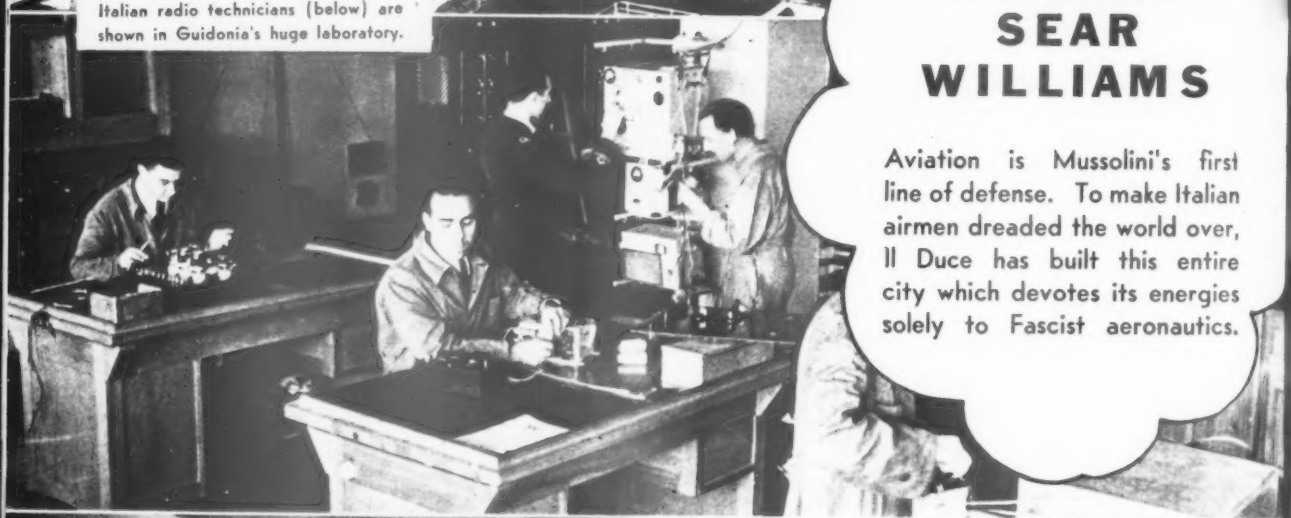
(*Continued on page* 97)

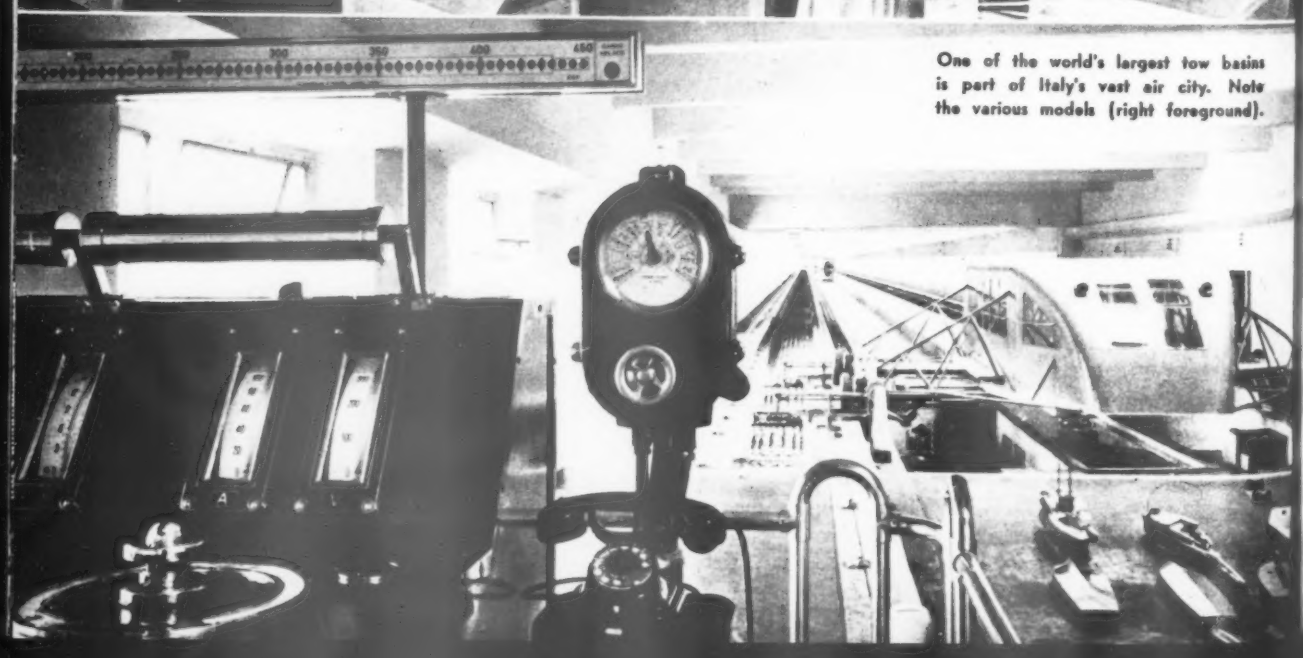
GUIDONIA-

Above is the Guidonian civic center. Italian radio technicians (below) are shown in Guidonia's huge laboratory.

by GORDON SEAR WILLIAMS

Aviation is Mussolini's first line of defense. To make Italian airmen dreaded the world over, Il Duce has built this entire city which devotes its energies solely to Fascist aeronautics.





One of the world's largest tow basins is part of Italy's vast air city. Note the various models (right foreground).

Italy's AIR CITY

IMAGINE a stream of air passing through a 15¾-inch tunnel at 1,428 m.p.h.! So great is this speed, in fact, that a visible air bow-wave is formed, much as an ocean liner's bow throws a wake as it plows through the water. Such an air tunnel, known as a "supersonic" type, is now in operation at Guidonia, Italy's experimental air city. Located just out of Rome, in the shadow of the Apennines, this ultra-modern aeronautical laboratory is a lasting tribute to one of Italy's great aviation pioneers, General Allesandro Guidoni, who, among other feats, developed the present standard parachute used in Italy. This experimental center corresponds closely to our N.A.C.A. laboratory, or Britain's Martlesham Heath station, and consists of three main sections: the departments for experimental airplanes and engines; radio and instruments, and technological chemistry. Each section has its own separate buildings and the entire city is laid out with an eye not only to efficiency, but to beauty as well. This ambitious project has been under construction for almost three years, and consequently is of modern design throughout.

The department concerned with experimental airplanes and motors is likely the most intriguing of all departments, as it is here that the amazing "supersonic" tunnel, with a mouth velocity of 1,428 m.p.h., is being used. An intricate system of compressors and blowers is required to build up such a speed. A 13-blade turbo-compressor is the primary unit, being driven by a 3,125 h.p. motor which turns at 900 r.p.m., and which is in turn geared up to almost 4,000 r.p.m. The air, before passing through the compressor, is reduced to approximately 1/10th the density of sea level atmosphere. Due to the increase in pressure as the air passes through the compressor its temperature is raised some 350 degrees Fahrenheit. Before the air can be used in the tunnel itself, however, it must be cooled by running through a series of four refrigerators, which change the temperature some 620 degrees to a —(minus) 238 Fahrenheit. The air finally rushes through the 15¾-inch tunnel at more than 1,400 m.p.h. Many interesting phenomena have been observed. For instance, it has been found that when air reaches a speed roughly that of sound, 743 m.p.h., a distinct wave, noticeable with the naked eye, forms on the leading edge of the object under test. The wave is at approximately right angles to the object at this speed but as the speed is increased the wave gradually bends back along the sides until it looks much like a boat's wake. Authorities believe that this indicates a difficulty to be overcome in raising airplane speed over this "sonic" speed barrier. Once this bow-wave is broken higher speeds may easily be attained, in the opinion of Italy's engineers.

However, this "supersonic" tunnel has more than a future value as propeller tips have reached, and in many cases exceeded, the speed of sound, so such a tunnel proves exceedingly valuable to observe propeller tip conditions which closly approximate high r.p.m. engine operations. A special camera is mounted on one side of the tunnel, with a back light from the opposite side. Strangely enough, with the use of infra-red plates, excellent photographs have been obtained which clearly show the breaking "bow-wave" with no use of smoke, or any other visual means, usually employed in wind tunnels. This tunnel is proving invaluable in research into stratosphere flight, where conditions much like those reproduced in the "supersonic" tunnel are to be found. Italian scientists can thus foretell with reasonable accuracy the actual flight conditions to be encountered by future airplanes flying in the stratosphere at speeds greater than that of sound.

Other wind tunnels are used for ordinary testing. One building houses a battery of four six-foot tunnels. These units each have a 440 h.p. motor and can develop a velocity of about 160 m.p.h. A new tunnel of 1,300 h.p. and having an air speed of 220 m.p.h. has been completed by the Ansaldo company and is now in use as well. In addition, a vertical spinning tunnel with a throat diameter of 12 feet and a velocity of 57 m.p.h. is in use. Free-fall spinning can thus be observed, photographed and analyzed.

One of Italy's largest contributions to aviation has been the development of efficient boats and seaplanes, many of which hold world's records. It is not strange therefore, that an elaborate tow basin for models, or complete floats, has been constructed at Guidonia. This basin is one of the largest in the world, and certainly one of the most modern. It is 1,638 feet in length and has a water capacity of almost 3,000,000 gallons. Special anti-surge riffles are built into the bottom and sides to localize all waves during tests. The length of this tank is to be extended to 2,500 feet in the near future. A super-speed tow car will then be used that will exactly reproduce actual landing and take-off procedure. Two cars for towing models or floats are now in use; one for high speed model towing having a maximum velocity of 70 m.p.h., while the other, for larger models or full size tests, attains but 30 m.p.h. Both cars are electrically driven and have remote controls for operating. Intricate instruments are lo-

cated in the cars themselves to record all results of the tests, and cameras photograph the wave action and record actual speeds at various float positions. An automatic brake is provided to slow up and stop the cars as they approach the tank ends. Most of the new flying boats and seaplanes, as well as high speed watercraft, have been tested in this tank.

Radio research plays an important part in modern aviation and an entire building is given to this work. Receivers and transmitters for small fighters and heavy bombers are built and tested in the establishment's planes at the Montecelio airport. Many American radio testing machines and devices are used. All radio equipment for both air and ground use is thoroughly tested before actually going into service with the Regia Aeronautica. Experiments are now being carried out with blind landing devices, and results show promise of success. Systems in use in other countries, such as the German Lorenz and various American types, are also being tried.

Here an Italian engineer is shown testing a model of a Romeo RO-34 seaplane. Much expensive preliminary work is done with scale models.

An elaborate model shop and laboratory are important adjuncts of any such testing stations and we find Guidonia to be no exception to this rule. Wind tunnel models and test models for various new planes are built and tested here. Sections of new structures are also built for static full size tests by the metallurgical laboratory.

A well-equipped photographic section is maintained and tests are run on all of the latest cameras to determine which are best suited for aerial use. In addition, photographic chemicals and processes are studied and improved in a well-equipped laboratory.

Further departments are devoted to the study and improvement of navigation instruments, chemistry, physics, etc. Tests are constantly being conducted on various new paints, alloys and aircraft components to determine their suitability to various working conditions.

The engine test department has as its task the testing and improvement of new and experimental power plants, and the constant improvement of existing types, and in addition, runs tests on new fuels. All types of engines, both air and liquid cooled, may be tested in the elaborate testing chambers. A device that will test a single engine cylinder is in use, and with it actual running and cooling characteristics can be observed before the actual completed power plant is finished. An intricate remotely controlled fuel system is employed in these engine tests. Gasoline, alcohol and benzol are used in various proportions in aviation fuel, and the flow of each type can be controlled and mixed by one man at a centrally located switchboard. Flow-meters accurately gauge the amount and speed of fuel fed to all engines under test, while dynamometers and other necessary instruments, many of American make, keep accurate records of all running conditions of the engines.

In addition to these strictly technical buildings, Guidonia also has a complete civic center. A city hall, post office, police department, hospital, hotel, market, cinema and school are all provided in this well- planned city. In addition, a modern aeronautical engineering school is to be completed, where future designers and technicians will get first hand information and training in all aeronautical subjects.

Since its completion in October, 1937, Guidonia has been in full swing as an experimental aviation city. More than 2,000 people can be accommodated with ease, and present plans call for raising the total to 5,000 within the next year.

Adjacent to Guidonia is the Montecelio airport, base of the Regia Aeronautica, and one of Italy's finest fields. Here are kept most of the new and experimental ships just out of the Italian factories where daily flight tests are undertaken by the regular flying staff. In addition, members of the Guidonia staff made regular flights for weather and radio tests and also observe flight tests on new engines, fuels, instruments and components of all sorts. It is interesting to note that American Hamilton-Standard propellers (built under license) are used in a great many Italian planes, and American Wright *Cyclones* also are in production by a large factory.

The Italians have shown great respect for American aircraft and engineering. Many American aeronautical patents are being used in Italy under license, as are American products in practically every major nation in the world. Italy, like England, France, Germany and others, is a great user of American equipment, largely engines and propellers.

Despite extensive and exhaustive efforts on the part of Italian research workers and engineers, the American aircraft engine still dominates the field. Though there are many makes of successful Italian aviation engines being used by the Fascists, none have the reliability nor are as dependable as those designed and built by Americans.

This same is true of propellers and other modern American aircraft devices. Efforts are made in Italy's three research bases (Guidonia, Vigna di Valle and Furbera) to equal or better the many American inventions that have been perfected during recent years.

The three above-mentioned research bases are constantly at work on practically every phase of aeronautical effort: tests of aerial and hydro-dynamical devices, research work on aircraft engines and accessories, the examination and testing of new inventions pertaining to aeronautics, the selection and testing of aircraft armaments as well as the experimentation with and development of new aviation instruments.

No matter what one's attitude may be as to the Fascist program we cannot ignore the fact that Italy now has one of the finest, most comprehensive, experimental aviation laboratories in the world.

END

Two Caproni attack bombers skim low over Guidonia's hangar and shop roofs.

THE FIGHTING MARINES

Ships THAT FAILED

by FRED E. BAMBERGER, JR.

Uncle Sam's military men are the world's most fickle aircraft buyers. The shaking heads of Navy airmen has spelled the doom of millions of dollars worth of airplanes.

This Douglas torpedo-bomber was built in 1932 but was "flunked out" in tests.

IT IS a well known fact that the United States Navy is very exacting when trying out new and experimental airplanes. The tests given to new airplanes are designed to bring out any weakness in construction, and to see how much punishment the airplane can take before becoming unfit for use. This procedure of putting a new airplane through its paces takes almost an entire year, and if the craft satisfactorily passes through all these phases of experimentation, it is then accepted for service use. When an aircraft concern builds a new type airplane for the navy, it is built under great secrecy. If this particular airplane should crash while being tested, no details of it are made public and the airplane becomes one of the "mystery" planes which we hear about, but never see. Let us look into the records and investigate these "mystery" airplanes. Probably every aircraft manufacturer that has submitted airplanes to the navy for test purposes has had at least one rejected.

In order for an aircraft concern to build a new type airplane for the navy, it is first given specifications and designs to follow. These are issued by the navy department. Then the manufacturer must set up jigs, new tools, and various new equipment in order to build this special ship. It must be built in secrecy and must be finished in an allotted amount of time. Naturally all of this makes the cost of the new model tremendous. For an idea of how much it actually costs to engineer and build a new airplane for the navy, let it be known that the new Sikorsky four-engined patrol boat, officially known as the Sikorsky XPBS-1, cost over $1,000,000 to build. If it is accepted, the cost of the following airplanes of this type will be considerably less, due to the fact that the tools and jigs have already been set up. If, however, the new flying boat does not pass the tests, and is not accepted for service use, it will have cost the government and the Sikorsky concern over $1,000,000 for the experiment. It can be seen that the engineers must be right on their toes all the time in order to prevent the building of faulty equipment. It has often been said that "The best laid plans of mice and men often go astray," and so it is with the aircraft engineers and manufacturers.

The Army bought many Curtiss A-12's, but the Navy rejected this adaptation.

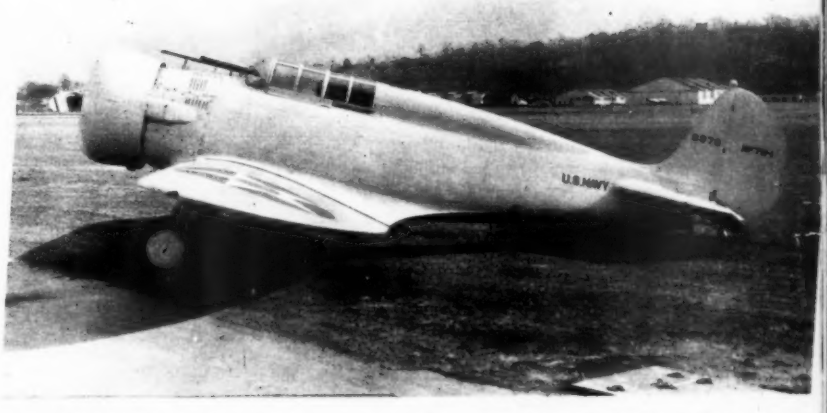
Jimmy Collins, test-pilot-turned-writer, flew a "ship that failed" to his death.

This Great Lakes XSG-1 was built in 1932 as an amphibian for carrier use and competed with the XS2L-1 at the bottom of this page for the existing Navy bid.

They cannot foresee everything, and often when a new airplane is finally completed, it turns out to be a "dud", and goes into the category of the "ships that failed".

The Boeing company has been supplying aircraft to the navy for a long period of time and yet they have had hard luck with some of their models. They built a single seater fighter with a parasol wing mounted on struts over the fuselage. It was a rather clean and efficient looking airplane and was officially designated as the Boeing XF5B-1. After being tested by the navy, it proved to be a "dud", and was rejected for service use. The magazines, however, had written about it and had published pictures, and a great many people who had never seen it and did not know that it had been rejected by the navy, thought that it was one of the "secret" ships. Nothing more was made public concerning this airplane and even today the Boeing XF5B-1 remains more or less of a "mystery" to most people, while in reality it really was a ship that failed in its tests. The Boeing company built a later model known as the XF6B-1. This was a biplane, and it looked like a smartly modified version of the famous F4B-4. After being tested, however, this one, too, was rejected as it was too heavy and too slow. The newest creation by Boeing in the line of fighters for the navy is the XF7B-1. This is a low-wing type somewhat similar to the Army P-26A pursuit. I was fortunate enough to witness this airplane being flown during its terminal velocity dive tests. During this test the pilot dove it "clean off the dial," which means that the needle of the accelerometer had reached the highest point on the dial and remained there. The terrific pressure to which the airplane was subjected to in this 14G dive caused the heavy windshield screen to disintegrate and cut the pilot's face severely. It also buckled the riveted metal skin of the fuselage from the engine mount back a considerable distance along the side of the airplane. The pilot landed the ship at nearly 120 m.p.h., with blood streaming down his face, narrowly avoiding a crash. This airplane has since been redesigned, but whether or not it will be accepted is still in the balance.

The Curtiss company is another big



Boeing tried, both in the Army and Navy, to make a success of the above design.

This rugged-looking Loening (below) flew many tests, was finally rejected.

One of Boeing's most popular types of a few years ago was its F4B series of Navy fighters. This refined model, the XF6B-1, failed to succeed the F4B type however.

This Curtiss fighter (above) exploded over Buffalo during early test flights.

The XF3J-1 (below) was one of several Berliner-Joyce types to be rejected.

contributor of airplanes to the navy. Many of the airplanes they have built are well known, such as the *Goshawks* and other types. Not so well known, however, is the Curtiss XSC-1. Practically nothing has ever been published in the aeronautical magazines concerning this airplane. When one tries to find informatio on an airplane like this, and cannot uncover any, it may be reasonable to assume that the airplane crashed while being tested. There must have been an XSC-1, as Curtiss built a later model in this series known as the XS2C-1. This was a navy version of the Army A-12 *Shrike*. This proved to be a "dud" also after being tested by the navy, and was allowed to gather dust in a hangar of the Wright Corporation in Caldwell, N. J. More recently Curtiss built a snappy two-seater for the navy, known as the XF12C-1 fighter. It was a high wing type and had a big Wright *Cyclone* in the nose. Its wheels were retractable, and it looked like a real scrapper. It was taken up over Buffalo one day, for a trial flight. During the flight it blew up and threw parts of airplane all over the city of Buffalo. A man three miles away from the spot where the remains of the wrecked airplane landed was struck by a broken cylinder and had his arm sheared off. This was a decided setback to the Curtiss company but it did not daunt them, and from their factory has come the XF13C-1 and the new SOC-1 types.

Bellanca too has had his share of hard luck in the building of experimental aircraft for the navy. They built a new type monoplane for the service known as the Bellanca XSE-1. It was a new idea in service types and had folding wings for storage in a small space. While it was being tested at the Bellanca factory preliminary to turning it over to the navy, the pilot got into a spin and crashed. He was killed and the airplane washed out. They rebuilt it, however, and after several changes it was called the XSE-2. The navy tested it, but it was rejected as being too slow. Since that time Bellanca has not built any experimental models for the navy.

Grumman has been more fortunate with their airplanes than most of the other companies. One of their models, however, caused them considerable heartbreak, and a tremendous expenditure of money, before it was finally accepted. Most of us are familiar with the sleek and stubby little Grumman F3F-1 fighter. However, it was not so long ago on a damp and misty morning when the Grumman XF3F-1 was rolled out of the hangar for her first test flight. It was a beautiful little airplane, and the man who was to fly her, Jimmy Collins, looked her over carefully to see that everything was shipshape. He took off, and after getting plenty of altitude, he commenced to "throw her around". The little ship behaved beautifully. After stunting a while, he tried a few shallow dives, and turns and everything handled fine. He landed safely and made a few suggestions as to stability and improvement, and the Grumman people were prepared to

demonstrate their new fighter to the navy board. After navy officials had inspected the new ship, they ordered the tests run through. A few days later everything was ready. The fighter had been gassed, oiled and checked as to weights and military equipment, and was all set to show the government officials what she could do. After going through a number of various maneuvers, Jimmy Collins started on the terminal velocity dive tests. A terminal velocity dive means that the airplane is dived straight down until it is going at the fastest speed possible to attain. This dive is continued for as much as 10,000 feet, after which the airplane is abruptly pulled out into normal flight. This pull-out exerts a gigantic amount of pressure on the airplane and pilot. If there are any structural defects in the craft, this terminal velocity dive will bring them out. The navy requires several of these dives to be made in a new airplane. Jimmy Collins had made a few of these dives, and now was going up to try again. Every eye on the ground was riveted on that tiny speck up in the sky, which is rapidly getting larger. The roar of the engine and the moaning shriek of the wires became deafening. The very ground trembled from the vibration. Everyone was tensely staring upward, waiting for the pull-out. The airplane hurtled down at terrific speed. Lower and lower came the fighter and suddenly with a ghastly impact the Grumman crashed into the ground. The bitter irony of this crash was that after the crumpled ship finally came to rest, it was in a small cemetery near the road. This accident came as a stunning shock to the Grumman concern. Not only did it cost them a tremendous amount of money for the wrecked airplane, but they lost a fine test pilot as well. They built another ship, however, and it was taken to the Naval Air Station at Anacostia for tests. Lee Gehlbach, another crack test pilot, was demonstrating it for navy officials. He put the plane through a series of maneuvers and finally started the dive tests. During one of the dives the little Grumman refused to come out. He fought to get the ship under control. He stood up in the cockpit in an effort to change the center of gravity, but, when that failed at the last possible minute, he bailed out. The ship was again washed out and had very nearly cost the life of another test pilot. With the experience gained from these crashes, Grumman again built the XF3F-1. This time she came through with flying colors.

The B/J (Berliner-Joyce) corporation had the poorest luck of all in the field. They built the XFJ-1 fighter and turned it over to the navy for testing. It was an odd looking airplane and it had the fuselage suspended between its biplane wings. The upper wing was gulled into the fuselage just behind the engine mount, and the lower wing was about a foot below the fuselage. This extreme low wing caused the airplane to ground loop one day, when the pilot made a rough landing. This necessitated the

(*Continued on page* 83)

This is the first of Berliner-Joyce's "hard luck" series for the Navy. After many revisions and refinements (see bottom of opposite page) the design finally failed.

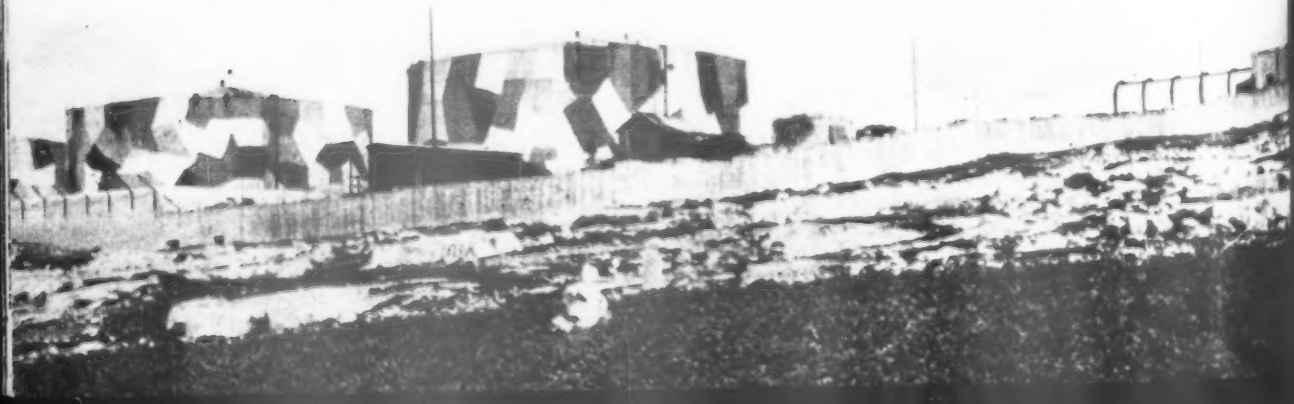
Consolidated's "Fleetster" (above) was tested as a bomber. Note belly bomb pit.

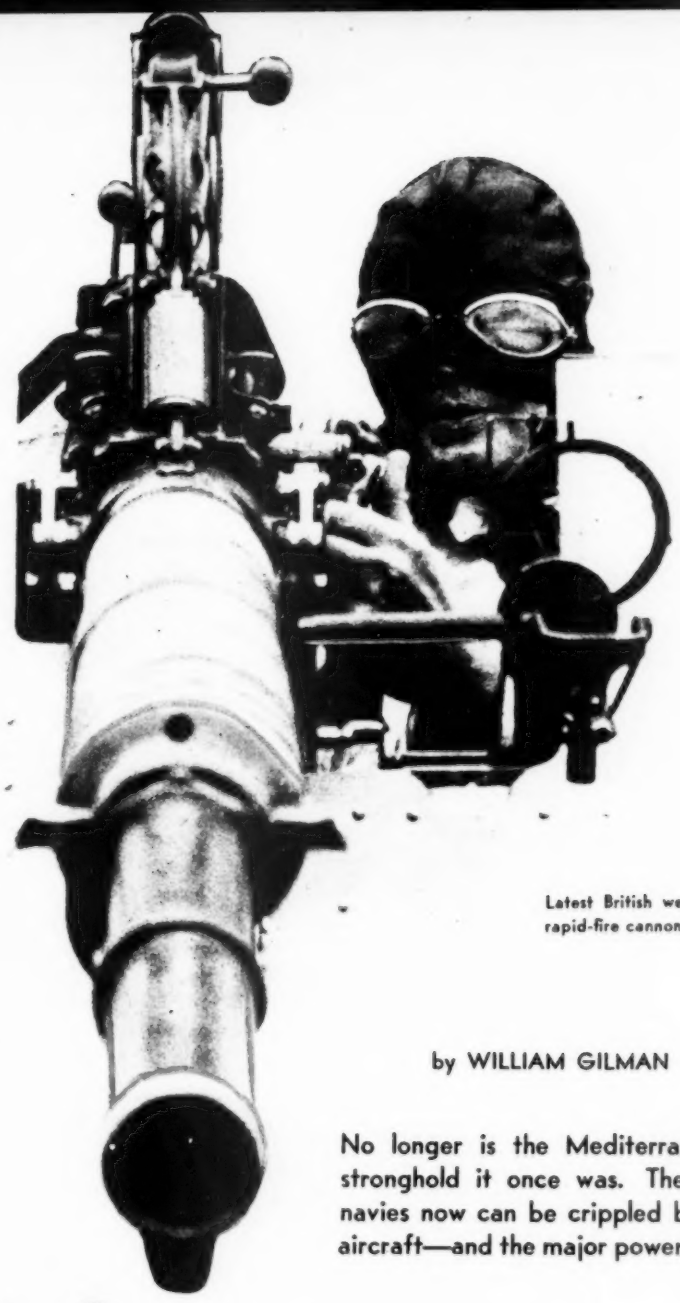
After a year of testing, the Northrop XFT-1 (below) joined other Navy "ships that failed."

One of the most remarkable aerial war photos ever made is this showing a direct hit that sank a Spanish rebel cruiser.

Wings OVER THE

The British at Malta have camouflaged these navy oil tanks so as to look like rocks and grass to invading enemy airmen.





Latest British weapon is this rapid-fire cannon for aircraft.

Mediterranean

by WILLIAM GILMAN

No longer is the Mediterranean the stronghold it once was. The biggest navies now can be crippled by enemy aircraft—and the major powers know it.

THE freighter *Express* plowed along, day after day through gale and squall, heading for Gibraltar at a snail's pace of ten knots, with nothing to worry us aboard except the problem: How to kill time?

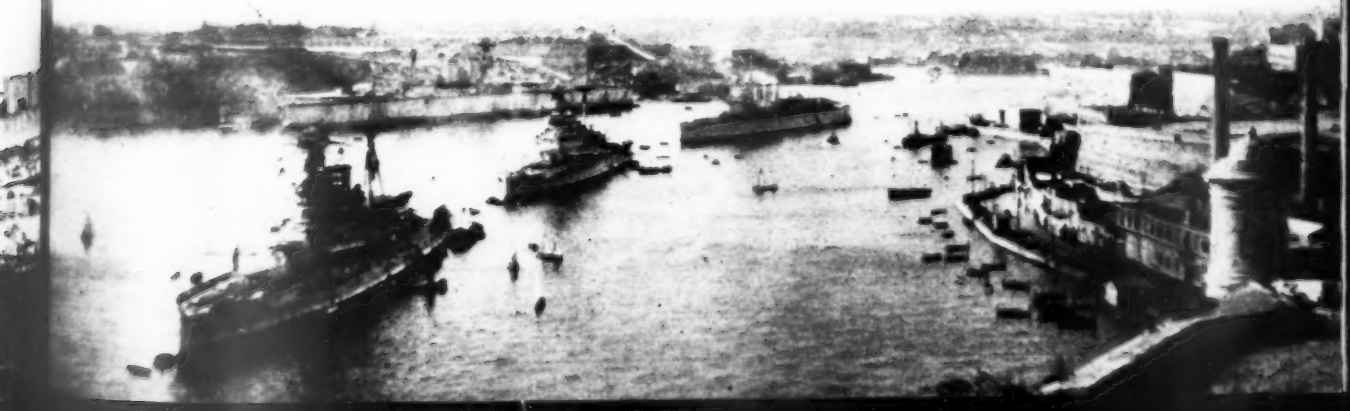
But on the 15th night out of New York, the atmosphere changed suddenly—the mental atmosphere I mean. All of us, captain, crew and five passengers felt a tension. It was that night we saw the lighthouse at Cape St. Vincent, Portugal, and knew the next day would find us in troubled Spanish waters.

A big American flag went up fluttering at our stern. The words AMERICAN EXPORT LINES stood out 12 feet high along the vessel's side. Surely no submarine would bother us!—an American ship without munitions aboard.

Nevertheless the tension was there all through that night and the next day. From the ship's bridge, binoculars kept scanning the sea for a submarine's periscope or other sign of danger. Ships were being sunk almost daily—more than 50 freighters had been bombed, shelled or torpedoed in the past few weeks in the Mediterranean or Bay of Biscay. It wasn't safe to rely on our being an American ship. Mistakes could be made. And this wasn't helped by the fact that contraband-running ships had learned the trick of dressing up like American vessels.

We were so busy inspecting the sea those few hours before Gibraltar that we were caught off guard by danger when it really came—from the air. Before we thought to look up, a far-off mutter had grown into a roar, and a gray plane had winged half the distance to us from the Spanish rebel coastland to our left. A few moment more, and the seaplane was swooping down at us with a great coughing of its two water-cooled motors. It was battleship gray in color, and the insignia was—a skull-and-crossbones painted in white. The plane looked like an old Douglas, but was probably a composite built from a variety of parts. Its struts screamed in the wind—it was pretty much a wreck.

Below is the harbor of Malta—a perfect target for high-flying enemy airmen. Some British warships are at anchor.



We watched anxiously as it loomed past the ship's masts and dove low over our flag. Three men were in the plane. Instead of the customary observation plane's personnel of pilot, observer and radio operator, this ship, we could see plainly, had pilot, observer and machine gunner. The last-named stood up in his cockpit as the plane coughed past the Stars and Stripes and gave us a friendly wave of his hand.

Three hours later, another rebel observation plane repeated the examination. It was a single-motored, air-cooled job. Again our examiners were evidently satisfied that we were not the "enemy" and two hours later we passed the Rock of Gibraltar, dark and brooding, and fortified to the hilt.

But two other ships that day were not so fortunate at the hands of the rebels. The radio told us about it. The French subchaser *Chasseur-91* was sunk by a plane off the island of Minorca. And the French freighter, *Oued Mellah* went to the bottom 50 miles east of Barcelona. She was sent there by bombs from two seaplanes which gave her "the works" shortly after she had been sized up by an observation plane with skull-and-bone insignia.

A few days later, the radio announced that the *Jean Weems*, this time a British freighter, had been sunk off Barcelona by a plane with the pirate emblem.

Who were these "pirates?" Obviously, whether they patrolled Gibraltar or sunk Barcelona-bound freighters, they were on the rebel side. It is a fact that the skull-and-crossbones, which later became merely a white "X", was the insignia flown by many of Franco's Spanish pilots. But it is also pretty generally understood that many of the planes were Italians, preferring anonymity.

This all shows that in the summer and fall of 1937 there was real international war in the Mediterranean, whether it was called "piracy" or "blockade-running." And for the first time in the long history of this historic sea, airplanes were the deciding factor. Wherever the writer went, in two months spent between the Mediterranean's natural gateways, the Straits of Gibraltar and of the Dardanelles, warplanes were almost constantly on the horizon. And it is bound to be even more so in the future, when and if Europe throws away the mask and really goes to war in earnest.

In fact, it was only Britain's backing down which prevented this war from starting in the Mediterranean back in early 1936. Italy was rampaging through Ethiopia and England countered by threatening to get the League of Nations to shut off Italy's supply of oil. Mussolini shouted back that such a move would mean war.

John Bull decided that discretion was the better part of valor just then. He didn't press the oil sanctions. And significantly, he quickly yanked his war fleet out of Malta—"the world's perfect harbor." The mighty battleships, policemen of the British Empire, were in a perfect harbor, but they were also a perfect target for Il Duce's airmen in nearby Sicily, only 60 miles away. And Mussolini publicly boasted of the way he had made England's mighty navy run.

The entire episode was certainly a strong argument in that old quarrel over the relative merits of warships and warplanes. Both Rome and London showed a lot of respect for the air bomber.

It's safe to say, too, that the entire Spanish mess has educated military men of all nations considerably. Two of the most spectacular sea events in that tragic business were the results of seaplane bombings—both by Loyalists—the sinking of the Rebel battleship *Espana*, and the bombardment of the German battleship *Deutschland*, the latter with a toll of 26 dead, 79 wounded. On land, the most spectacular if not important show of all was the routing of the Italian motorized army at Brihuega by strafing Loyalist aviators.

This rebel bomber was photographed by the author as it flew past the stern of his ship for a close look at the flag. The plane appears to be an old Dornier.

Naturally, that Brihuega affair could not happen often. It was an airman's dream come true, an army bogged in the mud along an open road. And it must be admitted that the constant aerial bombardment of Madrid did not win the city. But then, neither did the artillery shelling. Moreover, the Madrid show degenerated into duels between rival big guns and dogfights between rival air fleets after the Loyalists built up their air force with Russian machines and pilots.

Also, the results of that first attack on Madrid should provide a good sobering lesson for some aviation enthusiasts who are prone to become melodramatic over what an airplane can do to a big city. After all, there is a limit; there is such a thing as defense and counter-offense.

However, I do not intend to argue the old question of aviation, pro and con, but merely want to show that the various powers are more interested in fighting in and for the Mediterranean than ever before, that their weapon is the plane. You see, a bombing plane can do a lot of a damage to a city. But it can do just as much by sinking a ship full of food or munitions for that city.

The Mediterranean's importance should be obvious from any map. All of Europe's big nations have so-called "lifelines" crossing that sea. In time of war, as it is now in time of so-called "peace," its 2,000-mile length would be filled with ships of England, France, Spain, Italy, Russia, Greece, Germany, the United States—all carrying food, clothing and arms. Most of France's oil must come across the Mediterranean from Iraq. It is the main route from France and England to their colonial empires. It is Russia's outlet from the Ukraine and Caucasus. It is the only big highway which brings Italy's necessities, and Germany does a big part of her trading in this sea. In general, Asia and Africa have the stuff; Europe wants the stuff; and the Mediterranean is the road along which it must pass.

But things aren't the same now in the Mediterranean, from the viewpoint of strategy. The sea has three entrances: Gibraltar, the Dardanelles and the Suez Canal. In the World War, when aviation was still in its swaddling clothes, Britain's job was comparatively simple: control the Suez and Gibraltar, and open up the Dardanelles to Russia. She succeeded in the first two objectives, failed in the third.

The flight of Britain's fleet from Malta during the Ethiopian crisis and the record of piracy during the Spanish imbroglio prove that times have changed. Airplanes have changed them. For instance, of about 50 recorded attacks upon shipping during the tense summer days of 1937, 30 were made by planes.

Another look at the map shows why times have changed, why Il Duce claims the Mediterranean is an "Italian sea" and why other powers are building up their armaments to dispute his claim.

It is not a vast ocean and because it is relatively small, a good land base for planes can be more effective than aircraft carriers. Consequently, along with

(*Continued on page* 85)

MONSIEUR LE WARRIOR

Which is another way of introducing France's newest warplane, this four-engined Potez.

This is Archbold's original "Guba" which he later sold to the Soviet government.

STREAMLINED EXPLORING

Air-minded, young Richard Archbold will fly on his next exploratory trip to Samoa and the South Seas. Making him an aerial pioneer.

by JAMES McQUEENY

THE pith-helmeted explorer who travels exclusively by mule train through tortuous jungles and miasmatic swamps in quest of Nature's secrets or remnants of lost civilizations has become passé.

Exploring has gone modern; the accent definitely is on scientific equipment. Pack trains are being supplemented with giant flying boats that shrivel oceans and continents; radio direction finders are sharing honors with native guides, and parachutes are pinch-hitting for human carriers in getting supplies into impassable country. Even signal fires and tom-tom telegraphs have been pushed into the background by the latest two-way radio equipment.

The ringleader in this move toward scientific exploration is 30-year-old Richard Archbold, research associate of the American Museum of Natural History, who is leading an expedition into the interior of New Guinea to study the life history of the birds and animals of that remote section of the Pacific. His route: the Pan American Airways' to Hawaii, Midway, Wake, and Guam, and from there straight south to New Guinea—a distance of more than 8,000 miles. His exploring equipment is as modern as tomorrow's newspaper.

Despite his age, Archbold is no newcomer to the exciting vocation of collecting flora and fauna in out of the way corners of the world. He's been hitting the adventure trails since 1928 when his skill as a photographer won him a place in an expedition to Madagascar, sponsored by the American, British, and French museums of natural history.

While preparing himself for the trip he became so engrossed in the study of mammals he decided to go along not only as a photographer but as an animal collector as well. With eight members of the expedition he started out from Paris and spent two years on this exotic island of the Indian Ocean, making a representative collection of its birds and animals. After that, Archbold was spoiled for any other work.

The step-by-step changes in exploring methods may best be shown by his previous visits to Papua, which is that portion of the great island of New Guinea that lies to the east of the Dutch territory and to the south of the mandated territory. His first trip in 1932-33 was highlighted with transportation difficulties as travel was almost exclusively by mule train or afoot.

"The most noteworthy accomplishment of the first visit was the collection made during the month's stay on Albert Edward, which is 12,000 feet above sea-level. Because of its rugged approach, this was the first party ever to make an extended stay on the top.

In order to reach their objective, the exploring naturalists had to whack their way through 150 miles of wild country. For ten days the mule train plodded along a path made by missionary priests and then supplies had to be transferred to human carriers for the remainder of the distance.

Some of the native bearers, particularly those who were signed on during the trip inland, were a great trial to the museum workers. The weather was not very favorable. They feared rain on the high plateau because of their scanty clothes. Only three months previous, four of their number had died when caught in the rain while crossing this plateau.

"Twice in one night," related Archbold recently, "75 boys were on the point of deserting and had to be returned to the camp. Despite their promises, all but a dozen boys were gone by the following morning. With the aid of a missionary, a new batch of recruits was enlisted and after three days of double-banking, or relaying, the expedition reached its destination."

During the nine months the party was on the trail, the explorer explained, it had plenty of time to reflect on the advantages of modern transportation facilities over the ones being used. It felt if

Archbold is the dark-haired man on the extreme left. He and his crew are shown aboard the original "Guba" sold to Russia.

this problem could be worked out in a more satisfactory manner, future expeditions would be productive of far greater results.

Upon his return to America, Archbold began making preparation for a return trip to Papua, this time into the mountainous and inaccessible interior north of the intersection of the Fly and Palmer rivers. Here was virgin field for an expedition, as only two men had been known to probe the depths of the uncharted interior and they had been awarded the Royal Geographical Society gold medal for their trouble.

"Because of the natural and mechanical difficulties," the explorer continued, "no previous expedition had been attempted. We felt, however, that with an amphibian airplane we could cover the area thoroughly without being cut off from our source of supply."

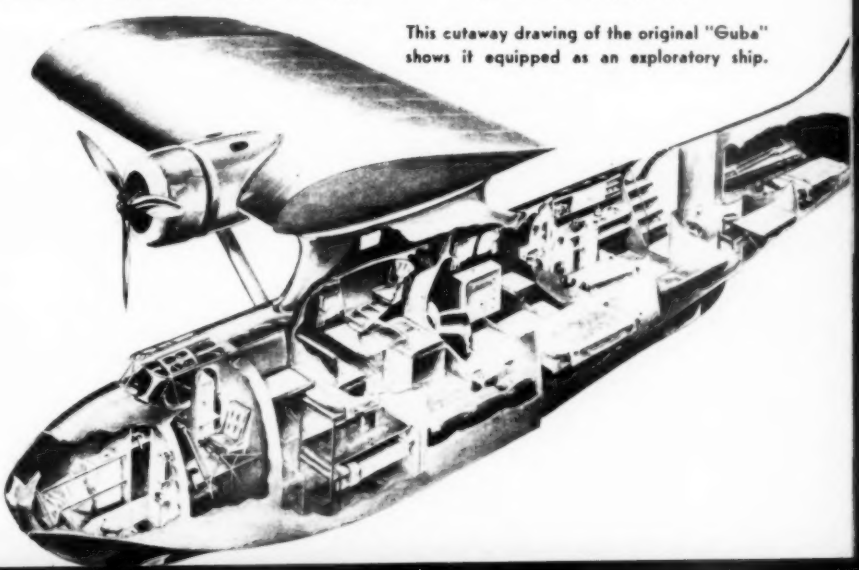
The purchase of an amphibian was one of Archbold's preparatory steps. The next thing he did was to learn to fly it in expert fashion before it was ready to be shipped to Brisbane, Australia.

As soon as the boat docked, he took off in the plane for the base camp at Daru, Papua. Flight explorations were begun immediately. They were in the form of observation trips covering thousands of square miles over the 325-mile gap between Daru and Palmer River Junction, and the Central and Victor Emmanuel ranges. On the aerial maps they made, all points were figured in miles from the mouth of the Fly River.

The ground party consisting of Austin Rand, George H. H. Tate, Allan Willis, and Michael J. Healy, together with 65 natives, started up the Fly River. After they had traveled some 325 miles, it was estimated that within two weeks' time they would be at the 610-mile marker, a spot suitable for the dropping of supplies from the plane.

Accordingly, at the end of the two weeks the amphibian, loaded with supplies, took off from the base camp for the 610-mile marker. Arriving at the designated spot, the flyers circled for some time in effort to discover the prearranged signal. But the advance contingent was no where to be found, and the flyers headed back to camp to see if any word had been heard from them. Three-quarters of the way back, they espied a camp fire. Although the river was narrow and fast, the aircrew came upon a stretch sufficiently straight for a landing. Taxying up to a sandbar, the plane was

(*Continued on page 70*)



This cutaway drawing of the original "Guba" shows it equipped as an exploratory ship.

I TRIED SOARING

by "PETE" BONOTAUX

Americans, though they have the best soaring country on earth, have woefully neglected the fascinating sport.

Gliding is fun, even in South Africa where this picture was made. The ship is a secondary soarer and was launched by the men with the rope in the foreground

THE other day at the airport I noticed five boys in a car drive to one corner of the field towing what looked like a long camp trailer. I watched them for a moment and saw them open a rear door on the trailer and draw out a set of wings. I thought it rather queer and strolled over to investigate. Before I could reach them they had completely unloaded from their trailer, wings, fuselage, struts and tail surfaces and, what's more, they had started to assemble them. Within a half hour from the time they first arrived they had completely assembled a two-passenger glider without much effort. Their craft was as sturdy as any ship on the field and possessed exceptionally clean lines. It also had a neat, completely enclosed cabin with tandem seats, dual controls, and about four instruments. While I was critically inspecting this new "animal" one of the boys had run out a 500 foot rope and stood waiting in the field for a regular three place biplane to taxi up to him. As soon as the plane reached the boy with the rope, he attached it to a special release hook mounted on the plane's tail skid and then ran back and attached the other end to the nose of the glider. After both pilots waved an O. K. to each other, the pilot in the plane proceeded to take off, towing the glider. The glider was in the air in less than 200 ft. while the plane took just a little longer than usual to get off. Both climbed in a normal manner making a wide circle of the field; in less than 10 minutes they were 3,000 ft. above us. Suddenly the distance between the two ships became greater and one of the boys told me that the glider had cut loose from the plane and that the plane would now drop their tow line on the field and land. What about the glider? Oh well, they planned to stay up for about three hours before they landed because one of the boys wanted to practice tight spirals and learn how to fly in a "thermal". All of which was astounding information to me. Of course, I doubted all this and hung around to see for myself. I did, but at the price of a stiff neck. However, the pain in my neck was overcome by my admiration of the beauty and the careless grace with which that glider circled and spiraled up into one cloud and then another, seemingly without effort. At the end of three hours the glider did return to the field, and in the most graceful manner imaginable, proceeded to land. Once on the ground the pilot let the ship roll on its one wheel back to the corner of the field where it had taken off!

A soaring pilot's paradise are these rugged, snow-topped mountains.

The two pilots jumped out and said that the "thermals" were fine, whereupon two of the other pilots climbed into the glider after someone had summoned the tow plane, which again towed them up 3,000 feet. It was then 1:30 p.m. and within 30 minutes they were out of sight, but at 5 p.m. they were back over the field, gradually descending in wide circles until they were low enough to yell down that they were going to land. As soon as they landed the five boys started to dismantle the glider and place it back on their trailer. Within a half hour they were ready to drive off the field. I asked the boys why they didn't keep their glider in the hangar and they said that the hangar already was too crowded with planes and that they couldn't afford the $20 per month hangar rent. I couldn't help questioning the boys more about their sport and just what it did cost them.

There were only five boys in the club, all of them just out of high school, and they owned this glider jointly. They had formerly been on a model airplane club

ING

First step up from the primary glider is the secondary soarer shown above. For all-round sport, this type is recommended.

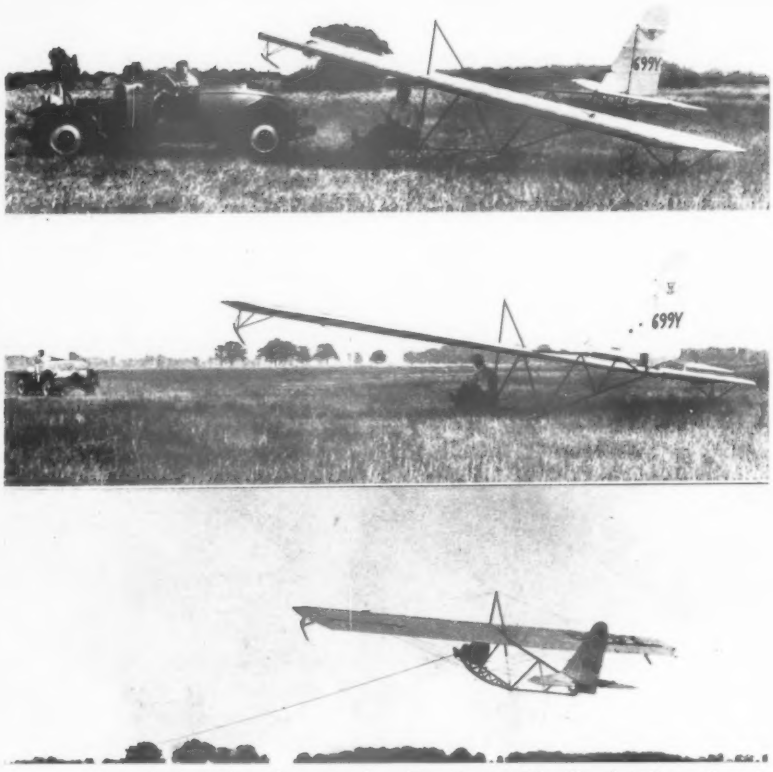
until they discovered that they could easily and safely build a glider within their means and really fly—fly more than they could in airplanes for the same money. They found that sets of construction plans for two-passenger gliders were available and decided to build one. Their previous experience with models gave them understanding enough to follow out these plans and what they couldn't make themselves they had a licensed airplane mechanic do for them. Each fellow had put in $100 towards the materials needed for both the glider and the trailer and spent their summer vacation building up the ship. When it was finished a Department of Commerce inspector looked it over and licensed it. They were sensible about how they learned to fly. One of the boys had had some airplane time and acted as instructor for the other. During their training stages they didn't use an airplane to tow them, but a winch which they also made. This winch was a drum that was attached to a rear wheel of a car and was operated by the car's motor. This wound in about 3,000 feet of tow rope fast enough so that the glider could climb to about 700 feet altitude and then release the rope and glide down, making several "S" turns, a figure 8 or two or three 360° turns before landing. With good teamwork, a flight every five minutes was standard practice so that for each hour spent in training by the club, a student made at least 10 landings. Within a month after completing their glider they had all soloed and could handle their ship with perfect safety. By having a two-place glider they were able to have the instructor fly with each student, thereby avoiding serious and minor accidents. Students were not only learning to glide in a safe manner but in an easy and quick way because conversation and verbal instruction was as easy as in a car.

After they all had earned their glider licenses they each took about one hour's instruction in power planes in order to accustom themselves for airplane tows.

I asked them how many other fellows in this country were interested in this sport and they said about 1,500 glider pilots were either flying as they were or else were designing and building up new gliders. The Soaring Society of America, a nation-wide club of glider enthusiasts, keeps them informed on happenings and new developments in their sport. After giving me a very interesting explanation of it all they invited me to take a hop with them and I accepted their offer the following day. It was hard to trust this strange ship without a motor. However, my curiosity compelled me to see it through. My first glider flight was with more nervousness and excitement than my first airplane ride but once under way, the thrill of it all was far greater than any airplane flight and whatever fears I had had vanished because of the perfect beauty and sense of freedom about it all.

All this didn't dawn on me until after we cut loose from the airplane which was towing us. We cut loose at 3,000 feet and proceeded in a straight glide at about 35 m.p.h., which was just half of our airplane towing speed. Suddenly our left wing tilted us up on our side. My pilot gave a glad shout for we had found a "thermal". Instead of just giving opposite control to level us off again he dropped his nose a little and turned to the *left*, into this "bump", and we immediately started to rise. We did not fly level in this lifting current but in a very tight spiral with an air speed of about 45 m.p.h. or more.

Being enclosed in a cabin and having no motor, conversation was easy as in a living room. My pilot then explained



Learning to glide with a rugged, stable primary glider like that shown above is a little-known but wholly fascinating sport. While some "first flights" are made with the use of a ground crew and shock cord, the flight depicted above, from top to bottom, is more typical. The auto gets better results, needs just one man.

that a thermal was a rising mass of hot air in the form of a huge bubble that was ascending faster than our normal sinking speed. Our variometer, a very sensitive rate of climb instrument, registered a climb of five ft. per second. The pilot told me that the ship's normal sinking speed was 2 ft. per second so that the thermal was probably ascending a little more than 7 ft. per second. He told me to look up, which I did, and I noticed that about 1,000 ft. above us was a whisp of white starting to form a cloud. In a few moments we reached the cloud's base.

After leveling off, he gave me the controls and told me to head for the next cloud about half a mile away. I was surprised and thrilled to find the controls as sensitive as an airplane's and was amazed at how stable the ship was in any maneuver. My only instruction from the pilot was to fly exactly as I would my airplane but not to try and climb—just keep the nose a bit under the horizon.

After a few moments of peacefully sailing along my pilot told me to "speed it up," and laughed when I hunted for the throttle. He said that all that was necessary to speed up to 70 or 75 m.p.h. was to drop the nose just below my normal glide, which I did, and although we were at a much flatter angle than any airplane would glide we increased our speed up to 70 m.p.h. and only lost a few hundred feet altitude before we reached the lift under the next cloud. It happened to be a strong thermal and we bumped up a hundred feet before we flew through it. My pilot told me to turn quickly and head back in the opposite direction and as soon as I felt the lift again to spiral tightly in it.

After a half hour of this I was finding my own thermals and climbing back up to the cloud level with ease. I had been so fascinated and thrilled with it all that I hadn't noticed where the airport was. Being familiar with the country, I noticed that we had wandered about five miles from our airport. My pilot told me that we could work our way back all right for it was an ideal soaring day with plenty of clouds and only a moderate wind.

"We are free to fly in any direction," he said, "until about 4 or 5 p.m. when thermals start to give out."

He explained that glider pilots seldom wander too far from their home airport unless they are soaring in a contest where you were out to make a distance flight.

After landing at the airport I was determined to have a glider of my own. This new thrill of both sailing and flying combined was irresistible. Modern high performance gliders are rightly called sailplanes. Soaring will inspire the most seasoned airplane pilots and give them a new kind of flying of which they will never tire.

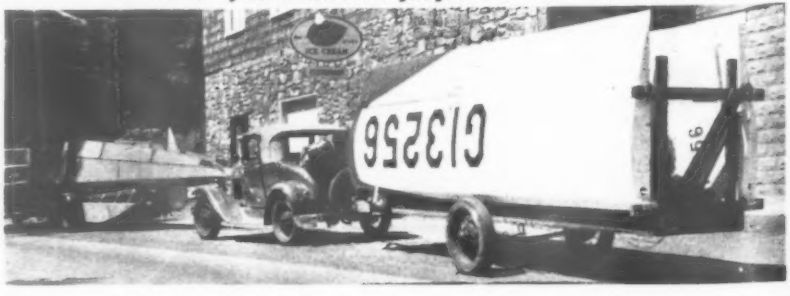
For the past ten years I've been flying airplanes and for the past two years have owned a good ship in partnership with two other fellows. Our flying is about average for that group of pilots with incomes under $3,000 per year and who only fly for sport. Our ship cost us about $2,,000 second hand. Repairs, overhauls and upkeep cost us $150 per year or more, plus $240 for hangar rent. Each one of us averages about 75 hours flying time each year. Gas and oil for our ship runs to about $2.75 per hour. Splitting up the yearly operating expenses, my 75 hours cost me close to $350 per year or about $4.65 per hour—just about half of what it would cost me to rent the same type of plane.

Most of our flights are on the weekends, and the evenings during the summer months, and consist of just flying for sport near our home airport. Very seldom do we make trips of over 300 miles.

After checking over my own flying cost figures I checked over what soaring must cost these boys per hour. First of all, they had no hangar rent, no motor to keep in repair, and no gas and oil bills. They made a much smaller initial investment than I had on my ship. Their total original costs were less than half of what any of the light airplanes would cost. Their only real flying expense was $5 for their airplane tow in order to start them on their day's sport. Their average flights were of four hours' duration and they could fly on almost any day that I would care to. Operating as a club of five, their total flying expenses cost them

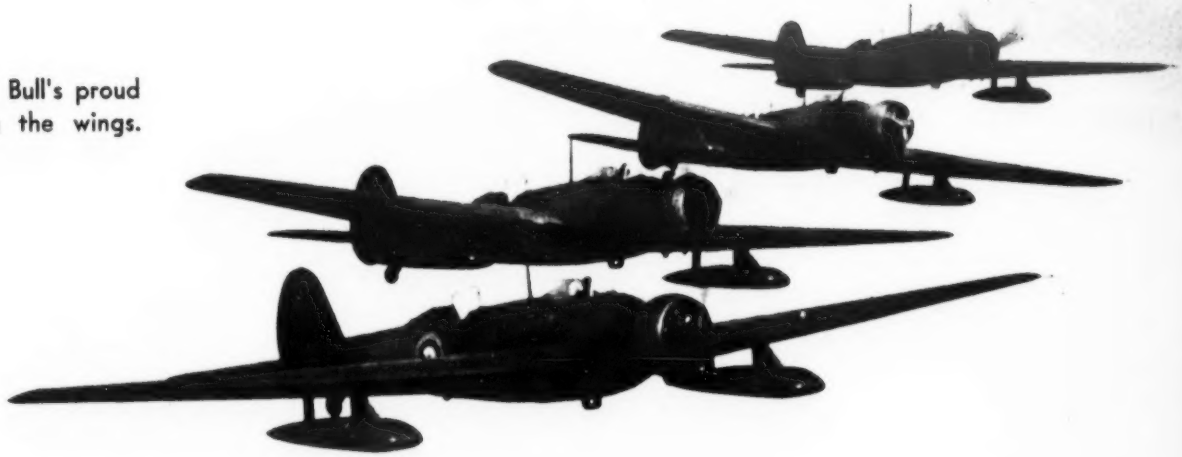
(*Continued on page* 84)

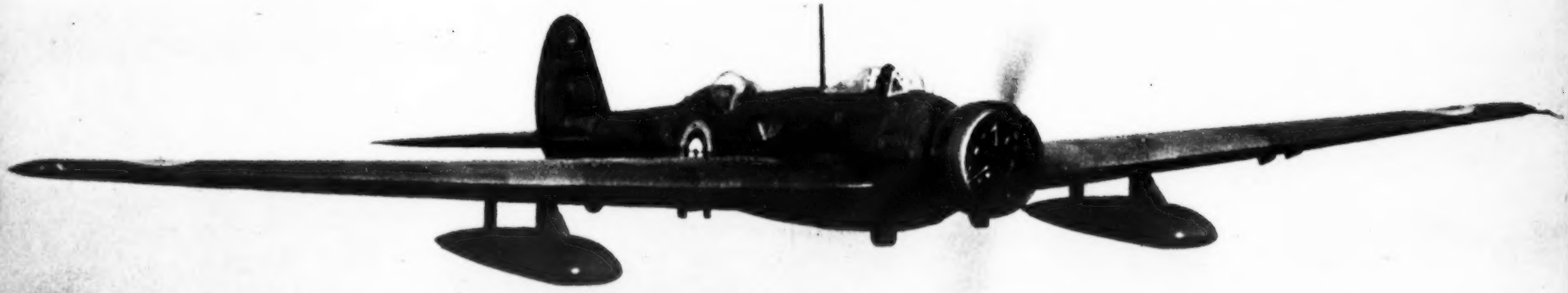
Simple gliders like that below are easily dismantled and carried on inexpensive trailers. This glider is stored in a garage and assembled and flown on week-ends.



LONG RANGERS

These Vickers "Wellesley" bombers are Johnny Bull's proud battleplanes. Those are bomb containers on the wings.





Youngest airline traffic representative is 17-year-old James Foster, Jr., son of a Kansas City financier.

Friedl Lang, son of Anton Lang of Oberammergau fame, just completed his instrument flight course at Parks Air College.

Personalities

Albert J. Baumler, 24, flew for Spain's Loyalists overseas, testified to Yankee excellence over there.

Clifford Elliott, 22, (left) taught his 16-year-old brother Douglas (right) how to fly recently. Douglas soloed in 2 hours 25 minutes.

Wallace Beery, veteran actor-airman, recently flew to New York from whence he sailed for a two months' vacation in Budapest and Vienna.

Richard W. Palmer, prominent designer, now is chief engineer for Vultee.

Blanche Noyes is the only aviatrix flying for the Air Commerce Bureau.

L. M. Gravis quit as a United Airlines pilot to fly for Holland airline.

Pretty Barbara Kibbee recently became the Ryan school's first woman commercial pilot.

Dale Carnegie wrote "How to Win Friends and Influence People", but admitted recently that Braniff Hostess Dorothy Lee Dreyer could give him some pointers.

The man at the left is the power behind the Consolidated Aircraft Corporation. He is Major Reuben H. Fleet, president of that company. The Fleet airplane bears his name.

The first air hostess club in the United States has been started in Alabama by 17-year-old Lorine Homan.

ED SINES, *Pal of the Wrights*

by CHARLES J. BAUER

Indirectly, Ed Sines played an important role in the fate of the Wright brothers. He was their only partner.

This is Ed Sines as he appears today. Both he and Orville Wright are aged 66.

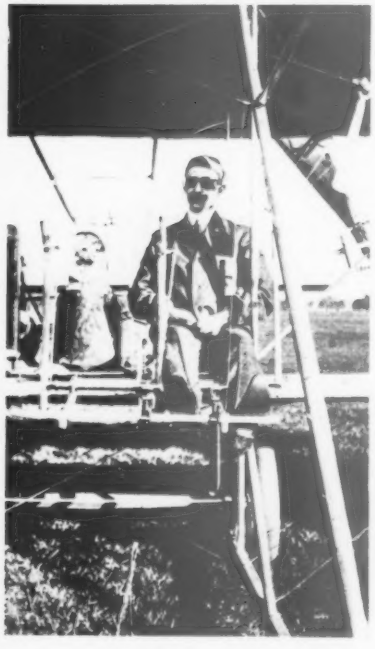
ED SINES, first and only active partner of the Wright brothers, never has been up in an airplane, and chances are that he never will be.

For Ed, boyhood chum of the famous pair, ended the partnership several years before the Wrights became definitely interested in the idea of flying. Today he retains the fast friendship of Orville, the surviving brother, with whom he swaps reminiscences of those early days. Wilbur Wright died in 1912.

Orville Wright, at 65, spends his declining years in a laboratory half a block from the bicycle shop where he and Wilbur built their gliders and first planes. The laboratory is a complete workshop, equipped with lathes, a wind tunnel and other equipment for aeronautical research.

Another half-block away is a printery, operated by Leo Stevens, the man who bought out the Wright-Sines printing business 38 years ago. Practically all of the original presses, binders, type and type chests were acquired last year by Henry Ford, and trucked to Greenfield Village, Dearborn, Mich., where they have been restored in the bicycle shop.

Here is Orville Wright seated at the controls of one of his later model airplanes.



Ford last year also removed the original Wright home, where Orville was born and Wilbur died, to Dearborn.

The only relic of the Wright-Sines printing venture left behind, inadvertently, was a line of ancient Tudor type which reads, "We Honor You." Stevens says he cannot explain how this single sentence happened to be mislaid, and only recently was discovered. The words are an ironic, if accidental, commentary on the indifference of Dayton citizens—who belatedly regret the neglect that made possible the removal of such historic shrines as the shop where the airplane was created and the home of its inventors.

In this house, too, was born their sister, Katharine, whose encouragement and aid during the early years meant so much to the Wrights.

Sines himself lived but two doors away from the Wright home. He recalls numerous escapades involving Orville, Katharine and himself, in most of which he came off badly; except, of course, that unforgettable instance in which the Wrights had come over to his house to play. Their mother called and they dutifully started to leave. Young Sines, disgruntled at their hasty departure, belabored them with a clothes prop as they climbed over the backyard fence.

Sines and Orville, eighth grade schoolmates, were 14 years old when they formed the printing partnership. The Sines kitchen was their workshop and Mrs. Sines, seeing some letterheads they printed on behalf of the firm of "Messrs. Sines and Wright," assured them they were indeed a pair of "messers."

The toy press, abetted by a motley of junk type, wood engravings Orville made, and some of Mrs. Sines' embroidery stamps, constituted the stock in trade. Bishop Milton Wright, the father, donated 25 pounds of second-hand type, Sines recalls. Bishop Wright edited a U. B. church weekly.

Wilbur and Lorin, another elder brother, were induced by their father to trade their rowboat for a real press, and this called for an investment in new type, which the partners managed by raising $1 apiece. Thus heartened, they undertook a school paper, *The Midget*.

In one issue they left the fourth page blank save for a diagonal line of which they were pretty proud: "Sines and Wright, Job Printing." Father Wright confiscated all copies, asserting the boys were becoming careless.

Besides cash, the revenue included popcorn and candy, Sines said, and when he insisted on realizing the edible assets, Orville objected that it was poor business, and bought his interest for $1, Sines' total cash investment. Sines then worked for wages and commission.

Several years later Orville built a

(*Continued on page 78*)

This is a printer's view of the only line of the Wright's type in existence today.

Leo Stevens bought the Wright print shop in 1900, still follows that profession.

BIG STUFF

Aviation officials from all parts of the world will witness the initial flight of this monster Douglas DC-4 at Santa Monica, Cal., on May 21.

If Major Alexander de Seversky's dreams come true, this is what the "cockpit" of his projected 120-passenger airliner will look like.

Boeing is no sissy when it comes to building 'em big. This is the giant flying boat that Pan American will use on trans-ocean routes.

WHAT'S NEW?

HERE are four of the latest additions to American aeronautics. Two of them are more or less conventional aircraft (Nos. 2 and 4). The others (Nos. 1 and 3), though freakish, are interesting—what we know of them. With the exception of Harold Johnson's new *Consolidated Special* stunt ship (No. 2) the craft shown on this page are deep dark secrets, more or less. Deepest and darkest of them all, though, is the Navy's latest torpedo-bomber, the Hall-Aluminum XPTBH-2 (Experimental Patrol Torpedo Bomber Hall—Model No. 2). This new seaplane (No. 4) is powered with two twin-row *Wasp* engines that drive Curtiss electrically-controllable propellers. It is reported that this ship already has passed most Navy tests. The odd ship above (No. 1) was built and is being tested by a Philadelphia concern. It appears to have a power-driven rear wheel and two independently steerable rudders. Ship No. 2 is a special stunt job powered with a 250 h.p. engine. It can climb 1,500 f.p.m. *upside down*. Ship No. 3 is a twin-engined lightplane. The engines are 40 h.p. Continentals. Now being tested in California, this ship has yet to be flown.

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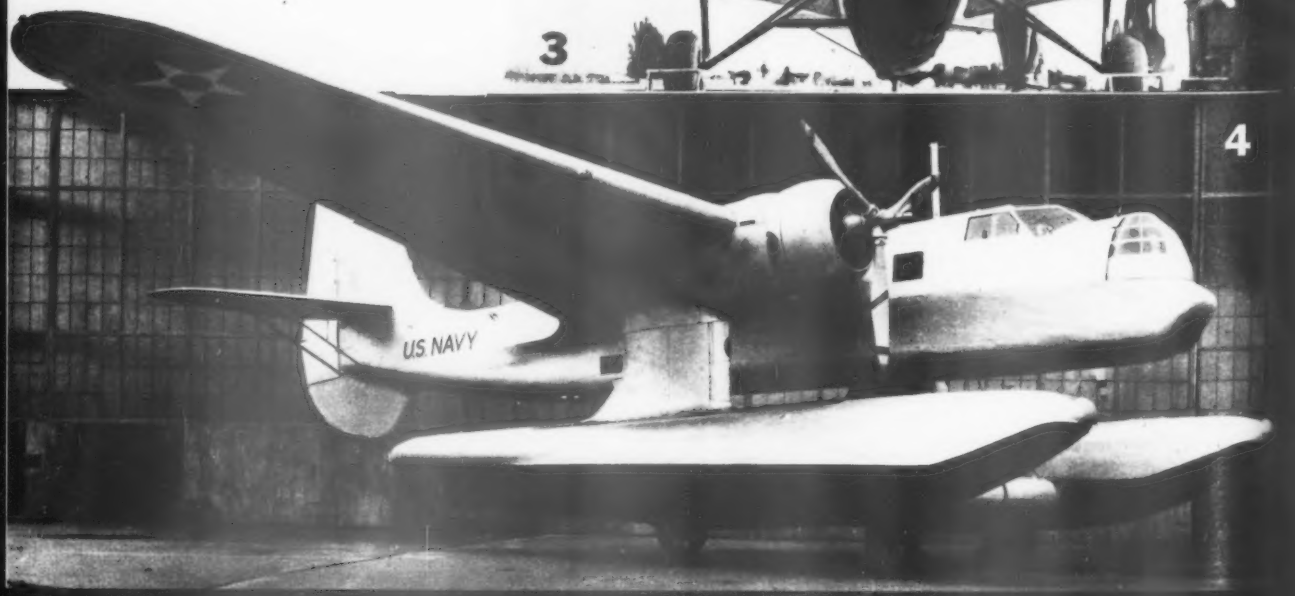

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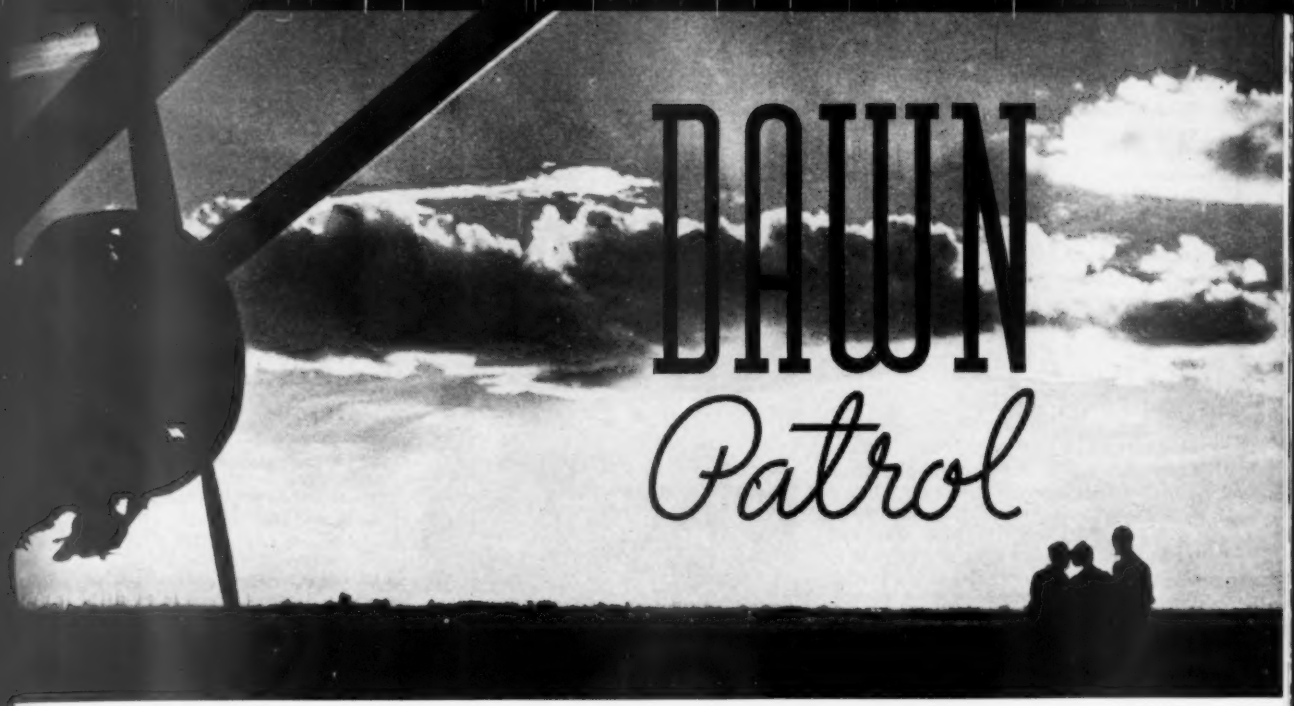


DAWN Patrol

by RALPH F. KREISER

When a bunch of plane-owners get together for a mass joyride, you have a whale of a time for all concerned.

"CONTACT!"

A twin-cylinder motor snaps into action on a *Cub*.

"Contact!"

The sturdy roar of a seven-cylinder engine on a Porterfield *Seventy* cracks the still of the morning air.

To the right the undulating whine of a self-starter on a Stinson wavers and from the left comes a muffled cuss—and as a warmly-clad enthusiast shifts his hold on a propeller for another swing. Then, suddenly, the silence is blasted with the sound of a dozen motors roaring to life at once as the day's light spreads over the mountains to the east. It's the Kern County Pilots Association's "dawn patrol" taking off.

It all began several weeks ago when, after a very busy summer, things began to get into the doldrums at Kern County Airport, key field in one of the first and finest county-owned airport systems in the United States. There were 14 planes on the field, summer flying activity was over and there was nothing in sight except bad weather. But, as one pilot reasoned, that bad weather was some time off and things could be doing in the meantime. So the idea of the dawn patrol was born. Details were arranged by Airport Superintendent Cecil Meadows and Les Buchner, president of the association and owner of a fleet of planes at the field.

All members were assembled that Sunday morning at daybreak and the flight began for Delano, 30 miles northward, where another of the county-owned fields was located. The squadron included eight planes, ranging from a flashy blue-and-white $15,000 Stinson to a Cycloplane whose navigation, the pilot said, necessitated a knowledge of free-ballooning and acute physical diagnosis, besides a constitution to withstand Arctic temperatures, since the cockpit was exposed. There were two Porterfields, a *Cub*, an Aeronca, three Stinsons and a *Robin*.

It clicked like magic. Plane after plane landed at Delano and the boys stood around, waiting for the last arrival—Spike Callahan and his Cycloplane, soaring desperately to the north, apparently moving about a yard a minute. Watching closely, the group on the ground saw Spike rise in his seat, reach up to the motor and sit down in a hurry. The motor continued its asthmatic sputtering and several minutes later, Spike taxied up to the line.

"What was the matter?" asked Meadows, a twinkle in his eye.

"That, that so-and-so motor," raged Spike. "A spark-plug wire came off and I reached up to put it back and she nearly kicked me out of the ship. I practically carried this thing up here on my back."

Breakfast proved to be a grand opportunity for "ground flying." Technical problems of navigation along the many roads and landmarks in the 30 miles came in for an airing and one of the

Meadows stakes his ship down before breakfast.

The gang posed for their picture at Mojave. Fifth from left in the front row is air-minded County Supervisor George W. Parish.

pilots remarked that if he hadn't dreaded the thought of being the last one in, he'd have gotten himself lost over the hills because all roads looked alike to him. "Didn't want to be the last one in so I followed the powerline." This was a dig at Meadows, whose war against powerlines around any airport is well known. He was promptly reminded that there were two railroad tracks, a main highway and three directional air signs to lead him to the airport and if these weren't enough, he'd better stick to street cars.

The next trip was to Taft, 40 miles westward. Reports of the first flight brought out a crowd for the second. Passengers fought for places in the ships and the Taft mayor and city council turned out to welcome the flyers for the day. The problem this time was not navigation but how to get all the people in the ships available. What a job that was. This writer took a look at the layout and went over in his car. As the planes warmed up for the take-off, Spike wrestled with his mulish motor.

"So long, Spike," yelled one of the pilots, his own Wright *Whirlwind* snorting comfortably and his passengers settling themselves in their seats. "See you in Taft," yelled another.

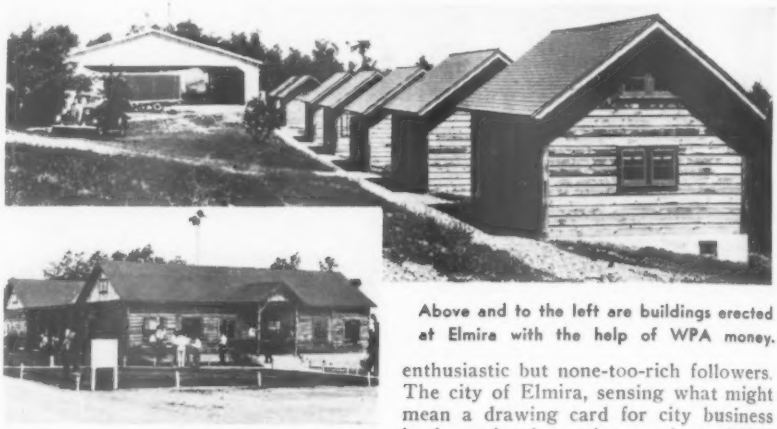
Spike changed his mixture, altered his expletives, swung the prop again and again. Just as the third plane sped down the runway, the motor caught. Spike smiled with satisfaction. He was going to fly to Taft. He turned his machine around, hopped in the cockpit and buckled his belt, gunned the motor and she died. After two performances of this nature, Spike apopletically wheeled his ship into a hangar, banged the door shut and ate breakfast in Bakersfield.

More ambitious was the third patrol. The destination selected was Mojave, 60 air miles over the mountains to the east, the route lying through the Tehachapi pass, which had only months before echoed tot he thunder of Army Northrops as they raced on missions to the Muroc army bombing range from the Bakersfield airport. Additional hazards existed in the form of shifting air currents and winds. But a larger crowd than ever gathered in the dawn of Sunday morning for the trip. Fourteen planes took off from Bakersfield and two from Taft. Through the pass sped the planes, all on different levels. Like a soaring Cardinal, a red Porterfield overhauled a canary-colored Aeronca and a *Cub*, which had taken so long to get up to the required altitude, now floated along as though this was the life for which it was made. The blue-and-white Stinson, the costliest of the lot, sliced the air higher than the rest and was followed by a Stearman.

Overseeing the flight was Airport Superintendent Meadows, piloting an Eaglerock and having as his passenger County Supervisor Parish, to whom flying was a new but exhilarating experience. The Eaglerock was the second plane on the newly-graded Mojave airport and the rest of them settled down

(*Concluded on page 72*)

WPA Helps Elmira Gliders



Above and to the left are buildings erected at Elmira with the help of WPA money.

ONE of the greatest, though little-known, American sports is gliding and soaring (see page 34). Though a great many sections of the United States are admirably suited to motorless flying, Elmira, N. Y., is the only established gliding grounds in the country. What little concerted efforts toward the popularizing of the sport have been made have been at Elmira. It is at Elmira that all national American gliding and soaring meets of importance are held. By comparison with other nations interested in soaring (notably Germany), though, even Elmira's meets have been somewhat sketchy.

With such a long hard row to hoe, American gliding and soaring has been little able to boost itself into greater prominence. True, there is the Soaring Society of America and its rich, enthusiastic president, young Richard DuPont. But gliding and soaring is far from being as widespread throughout the United States as that organization's name would indicate.

Hence, despite the fact that such persons as DuPont and famed Lt.-Comm. Ralph S. Barnaby of the U. S. Navy are active officers of the Soaring Society of America, the sport of soaring is hard-put financially. The sport's finances have been taken care of largely by its enthusiastic but none-too-rich followers. The city of Elmira, sensing what might mean a drawing card for city business in the national prominence given gliding and soaring activities in its hills, also has taken the sport to its heart. To its heart, that is, to the extent that Elmirans make much of coming meets and the city fathers "do their share." All this "financing," however, has been so spasmodic and comparatively minute that, until recently, little had been done toward the improvement of Elmira's facilities for the handling of the soaring meets and gliding activities in general. Hangars, workshops, etc., had, until recently, been the scantiest. Visiting participants used to have to put themselves up and generally shift for themselves.

Recently, though, Soaring Society officials and those of the city of Elmira apparently put their heads together and applied to the Works Progress Administration for a helping hand. Not only did they get it, they did a good job of getting it—as the accompanying photographs show. WPA funds were assigned to the project and workers were ordered to the scene. The results can partly be seen in the accompanying pictures. Permanent hangar facilities, living quarters and an administration building all were built on the WPA program. The entire Elmira grounds were improved to the extent that future soaring meets will have access to much better facilities.

Below is one of the new hangars at the Elmira gliding grounds. Next to this building are a series of small cottages where pilots and crews live during meets.

The MAN UNDER THE HOOD

By D. W. W.*

THE buxom blonde lady told the Western Air Express stewardess as the plane circled over Boulder Dam: "This is the best piece of work the CCC boys ever did. Do you know what they're doing now?" And the charming air hostess could not resist the opportunity to reply: "Yes, I do, ma'am. They've split them into two groups. One is touching up the Painted Desert. The other is in the Petrified Forest, raking petrified leaves." . . . And the buxom blonde said: "Thank you," and beamed happily, completely contented with the information.

* * *

The Air Transport Association did a "Now We See It, Now We Don't" last month and got a double dose of spring moving. . . . With the permanent staff of the association cut to Col. Edgar S. Gorrell and Fowler W. Barker, it was decided to move to Washington from Chicago headquarters. . . . Records, furniture, books, etc., were packed and sent east on a bus. . . . Then some meany dropped a remark in a senate committee meeting insinuating that the good colonel was merely a lobbyist. . . . White with rage, the colonel countermanded his orders and the furniture headed back to Chicago without ever having been unpacked in Washington. . . . Now the association's headquarters is back in the same office it left.

* * *

Being as how the Army Air Corps is pretty good at keeping secrets, it was just the other day that we heard of their latest experiment at Wright Field . . . seems Army engineers have rigged up one of the newest monoplane fighters with a twin-row engine that turns *two* props . . . one in either direction . . . much like the Italian Macchi seaplane racer of a few years back . . . advantage of this is the counteraction of the terrific torque set up by high-powered engines . . .

* * *

While our attention is on the Army, what is this about the Boeing B-17 *(Flying Fortress;* the same type bombers that recently flew to Argentina) shortly being released by the American government for "export to a friendly nation"? . . . we had heard some time ago that the British had put out a "feeler" . . . and that the War Department had known that England is after American warplanes long before that splurge in the daily press . . . so did we . . . but, being mere American citizens left to our own resources, we couldn't pin down enough facts so as to keep the State Department from jumping down our throats . . . anyhow, the British want American bombers—and want them badly . . . and we'll bet 1,000 to 1 they get them too . . .

* * *

China, it's understood, now has a batch of low-wing monoplane trainers being built by a West Coast manufacturer . . . we hesitate naming the company . . . because we thought it was in violation of the neutrality act to export aircraft to a warring nation . . .

* * *

Looks like Pan American Airways has its mind set on a new airline between Seattle and Alaska . . . connecting with their Pacific Alaska Airways up there . . . Joe Crosson, crack Arctic airman, went through Seattle recently en route to Florida where, it's said, he was to pick up a survey plane for the new route . . . ships to be used on the route probably will be Sikorsky S-42's, the four-engined flying boats . . .

* * *

American Airlines pilots are chuckling over the astonishment of a radio man and dispatcher who calculated that one of the company's Douglas DC-2 airliners made a speed of 320 m.p.h. between Battle Creek, Mich., and Michigan City, Ind., last month. The real story is as follows. . . . The regular crew waiting for departure time at Battle Creek took off five minutes early leaving word with the ground employes to record them out on scheduled time. . . . The ship then ran into a 100 m.p.h. tail wind at 4,500 feet. . . . Thus the extraordinary speed at the first check point. . . . It all happened because the co-pilot had a date with a Chicago gal and wanted to get home early.

* * *

That item last month about the American Airlines-Northwest Airlines deal disclosed some more dope . . . a reader informs us, that, back in the early days when Universal was the big division of what now is American, that company had a deal whereby a sizeable block of Northwest Airways stock was signed over to Universal . . . unless some other deal was quietly made, Universal (now American) still owns a bit of Northwest . . .

* * *

Since the March issue of POPULAR AVIATION hit the newsstands, this writer has been deluged with letters from readers who saw the item about the opening of the Army Air Corps reserve to qualified civilian pilots . . . Write to the air officer of the corps area in which you live to get full details on this matter. . . . The age limit for aplicants to the reserve has been raised from 30 to 35 years. . . . The Army is interested only in those who've had one year of college and 300 hours or more time behind 300 h.p. engines. . . . If you've had more than 400 hours the h.p. limit is waived. . . . But my advice to all of you is: *write to the air officer of your own corps area* for dope.

* * *

Did you know that the Air Corps has put out a general order to all pilots of Consolidated PB-2 pursuit planes prohibiting the spinning of that ship. . . . The order reads: "not only is the ship not to be spun but it is not to be put into such a position that a stall might result." . . . *Imagine a pursuit plane which cannot be spun!* . . . The reason for this is the fact that the PB-2s killed some of the Army's best test pilots who did spin them and were unable to bring them out.

* * *

Tex Rankin, who won the International Aerobatics competition at St. Louis last summer, has been spending recent months trying to find a suitable plane in which to defend the title. . . . He won it in a Ryan ST, but says the ship is entirely too stiff and difficult to fly again. . . .He wanted to buy a German machine, a Bucker *Jungmeister* with a 150 h.p. Siemens engine. . . . This airplane was built for advanced aerobatics and is a perfect tool for this work. . . . Tex decided against this plan in the fear that Americans would resent his flying a foreign ship. . . . So he's repurchased a Great Lakes biplane he once owned and is rebuilding it to take a 150 h.p. Menasco engine.

(Concluded on page 95)

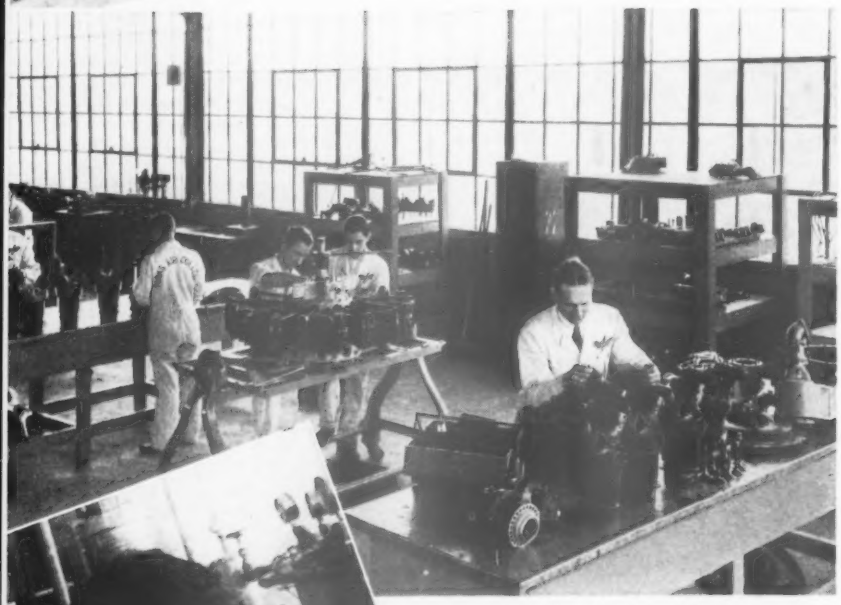
"... and now we'll try a barrel-roll ..."

*The author is one of the best-informed aviation men in the country, withholding his identity in order to maintain complete freedom of comment. —The Editors.

School

by KURT RAND

To you readers who contemplate attending an aviation school, this should be a help. It will answer many questions we have tried to answer.



These photographs show what the average air school student must experience. He must be thoroughly versed in every part that makes up the modern airplane. Flying actually is but a small part of schooling.

An able aircraft metal worker can command a good job. Welding plays an important part.

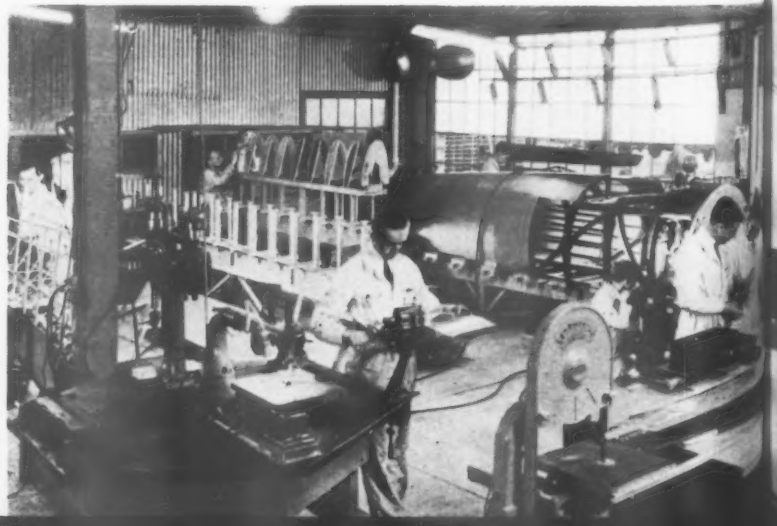
WHAT type of young man is the average student pilot today—learning to fly, or taking technical training in aviation? What is his educational background; his economic status; from what type of community does he come; what are his ambitions and what are his expectations for a career in aviation?

To answer these questions, the Ryan School of Aeronautics has conducted an extensive survey of its student enrollment which comprises more than 100 students training at this school.

From a mid-western, agriculture-supported community of 20,000 comes a clear eyed; bright-looking ambitious youth of 21—the average student pilot—to train for an aviation career.

John Average Pilot completed his high-school education three years ago. Like most young men of his day he was interested in aviation, but not until a year ago did he decide on a definite career in this industry. Financially assisted by his parents, John has worked hard the past year to earn a portion of his tuition.

His future was discussed at great length with his parents who, while they have not encouraged flying, have nevertheless consented to his learning to fly



Days

Radio plays a major role in student work.

and have, in fact, supplied two-thirds of his tuition money.

John has wired the school that he will arrive in San Diego by bus—the cheapest way he can travel, since he must conserve his funds. He is met at the bus station by a representative of the school, introduced to school officials, his enrollment is completed and he is assisted in finding comfortable living quarters in a private home.

Likely he will live at a boarding house

Competent instructors carefully lead the student through technical work.

Girls are not an uncommon sight at the modern aeronautical school.

Once through his elaborate ground training, the student at last gets to flight instruction. After he has mastered this, he faces a stiff instrument-flight course.

near the school with four or five other students. He shares a room with another student, finds a congenial atmosphere in a good home and pays $35 a month for board and room. Before breakfast and after dinner he "hangar flies" with his roommates.

Eight hours a day, five days a week he is at Lindbergh Field, following a definite curriculum, identical in educational purpose with courses offered at technical and professional schools in the older branches of learning.

He spends three hours a day in class, three hours in the school airplane and engine shop and 30 minutes to an hour flying. Saturday and Sunday John's time is free, but you may be sure he will put in an appearance at the airport at least for two or three hours each day.

After a year's instruction, when John has completed his training, he will be ready to begin his actual career in the aviation industry. But, John Pilot may be certain, if he applies himself to his schooling, that he will be qualified.

About 40 percent of the Ryan student enrollment is comprised of flying students; the remaining 60 percent taking mechanical training only. However, many of the student pilots also take extensive technical ground courses.

Of the flying students, most are enrolled for the transport pilot's course combined with a 12-months master mechanics course. Most mechanical students enroll for the full 12-months course. Second most popular flying course is the private pilot instruction designed especially for the man or woman who wishes to fly for sport, rather than as an occupation.

Nearly half of the flight students have had some previous training. These students have had an average of 40 hours flying experience before coming to the school. Their presence at the school is due to the fact that they realize the importance of systematic flight training and precision air work as against the mere building up of hourly flying time without a definite training schedule which will qualify them for the higher licenses now required for commercial work.

Practically all of the mechanical students and most of the flight students have had some previous mechanical work before coming to the school. Most of this experience has been gained on "fooling around with cars and motorcycles," although many have been employed as garage mechanics, welders, sheet metal men, marine engine mechanics and engaged in the upkeep of tractors and other farm machinery.

About half of the students enter school direct from employment, while the remaining 50 percent come from high schools or colleges. The older students have been employed or come from colleges, while the younger group, around 18 years old, enter from high schools.

Typical occupations of students before beginning their aviation training include: undertakers' assistant, grocery clerk,

(*Concluded on page* 88)

"Clear and Unlimited"

By SWANEE TAYLOR

Flight Critique . . .

Prior to leaving for Brazil, and the sound of clicking castanets, it was my happy lot to sprint out to Cincinnati to fly and report on the new Aeronca KC-A, and the KM, their new 50 h.p. models. Thanks to the geniality of Carl Friedlander, I flew both the Menasco and the new Continental A-50. Regrettably the Franklin air-cooled "50" hadn't arrived, so I can't report on that one.

Well, just as I've contended all along, ten more horses up front certainly do make a world of performance difference; you will find that you have a real, two-fisted little airplane in your hands when you sit down in it. And I can see where there will be a bigger swing than ever, in 1938, toward low-priced personal flying. Verily, the day has dawned when humans can purchase economical airplanes and really start going places.

As mentioned above, both the Continental and Menasco motors were aired-out on that murky March afternoon. But since this is not to be a discussion of the relative merits of the engines, we'll skip that one point. What I want to talk (rave is the word) about is the marvelous performance of this type of aircraft with the additional power. It is exactly what the doctor ordered years ago; I only marvel that the motor people didn't fill the prescription long back.

The Aeronca KC-A (and KM), hops off the ground, fully loaded, like a scared sparrow. I took off beside a Douglas DC-3 and climbed right along up with it foot for foot, until it was out of sight. Gone are the days when you have to fall back on the power of prayer to get 'em over the wires down at the end of the field. Each ship had over 500 feet by the time I reached the southern boundary of Lunken airport, and there wasn't much wind at that.

In the air both ships cruised at an honest 80 m.p.h. with top speed of 95. Which means that you can fly from St. Louis to Little Rock, or Richmond to Spartanburg, in roughly four hours flying time. Naturally with higher speed the ship answers the controls with refreshing alacrity, and there is a trim-tab on one of the flippers which allows you to relax on cross-country trips.

The new Aeronca has 11 sq. ft. more wing surface to take care of the added poundage that goes with 10 more ponies. This, however, develops into an added advantage. It not only carries the extra weight, but it gives you five miles slower landing speed than the former model.

They tell me that the KC-A and the KM will probably be ready to go into production just about the time that this falls under your eyes. It is still entirely up to the engine manufacturers to supply the power plants. I suppose, too, that the other lightplane companies (Piper and Taylorcraft) will be ready to announce their own 50-horsers at the same time. Then you watch the feverish scramble to fill a flood of orders that will make the Los Angeles deluge look like a spring freshet.

* * *

Oh senorita, fill my glass again, dear, so I can drink another toast to the 50 h.p. light airplane!

Re-echoed Growl . . .

Every now and again (when he runs out of thoughts, I suspect) old Col. Dave Behnke loops over a hot editorial in "The Air Line Pilot" on something I said in print a year ago during the holocaust of airlines crack-ups. I said that 99.44 per cent of all the crackups were due to pilot error. What the old Colonel didn't understand about that statement was that by "99.44 per cent" I was using an advertising catch-phrase which has long been the slogan of Ivory soap, used to imply practically total purity.

Now I know that the old Colonel washes himself, and I know, too, that he can read. Which makes me wonder the more why he can't (or won't) allow for a bit of columnistic color. However, at the time the offending article was written the crash reports showed only one structural (propeller) failure in some 20 mishaps. What's more, I had my own analysis checked by at least 10 active airline pilots before writing a word.

There must have been some truth in our deductions because, since that time airline crackups have fallen off to a new numerical minimum. And not one of them was due to pilot error.

However, I've just got to ask the old Colonel one question: Wherein does the fault lie when an airliner has to use lots of brakes to stay on the field in both Camden and Newark the same night? The government? The nasty old operators? Or could it possibly be that the pilot made a sloppy, thoughtless approach?

Jingobells . . .

Most of the people in the army and navy, like the majority of folks in any other walk of life, are good scouts, lofty enough minded and willing to give the other fellow a square shake. But, just like in other walks you are bound to stumble upon an occasional self-seeker who is more concerned about his own weal than in that of his fellow man.

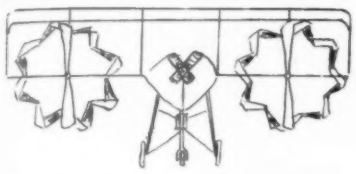
In military circles this type of individual is called a jingoist, a sword-rattling, smoke-snorting fragment of pomposity who is forever stirring up international discord with the idea of scaring his own country into giving him a better job. He wants most of all to have you believe that an enemy is practically ready to land on our shores tomorrow morning. Con-

(*Concluded on page* 94)

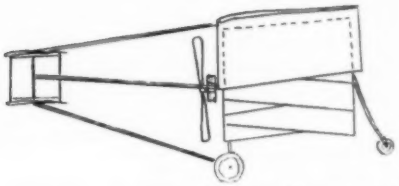
Now, Speaking of Brainstorms . . .

by LEWIS OWEN

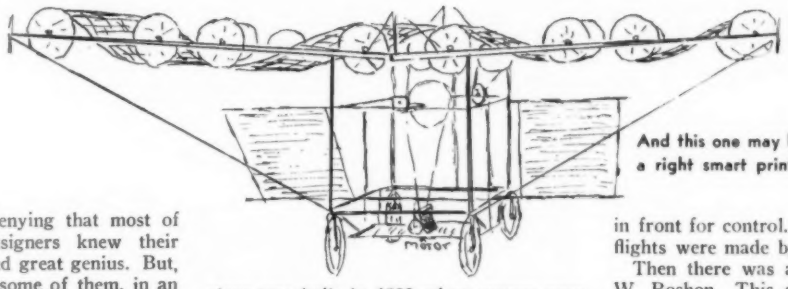
Maybe you think those old codgers didn't have some ideas when it came to flying machines. See for yourself.



This little item may cause a jitter or two.



Was this supposed to fly or mow lawns?



And this one may have made a right smart printing press.

THERE is no denying that most of the pioneer designers knew their stuff, and showed great genius. But, as is always the case, some of them, in an effort to produce a more perfect airplane, jumped the track beautifully. As a consequence, every once in a while a budding designer with a vivid imagination, and a pocket full of cash, would get up after a sleepless night and give birth to something that sometimes faintly resembled an airplane, but oftener—well—

Some of these brainstorms were so goofy that even Icarus would have looked askance at them (and if ever there was a guy who would try anything once, it was he). But the goofiest part was that many of these monstrosities flew, and flew darn well at that.

Take, for insance, Alexander Graham Bell's 1909 brain child. This was known as the *Cygnet* which is French for swan. Passing over the fact that it looks more like a chicken coop than a swan, we will go on with a description of it.

It was 13 feet long and 40 feet in span. The weight with pilot was 950 lbs. A 50 h.p. motor swung a ten-foot prop in the rear. For control, it had two horizontal stabilizers, and one vertical rudder in front. The whole affair was mounted on three runners. But, oh my, in place of wings it had a lot of tetrahedral cells (four sided), 3,610 of them, no more, no less. The pilot sat in a niche cut in the center of the mess. You're wrong, it flew.

Then there was one known as the *D'Equevilley*, after its designer. This plane was built in 1909 when curves were very much in style. The designer couldn't decide whether to use dihedral or cathedral, so he built seven sets of wings and curved them in the most graceful and pleasing way he could think of. A sort of Mae West effect was the result. This creation was only six and one-half feet long and was 16½ feet in span. There were no tail surfaces of any sort, and how the plane was controlled, if at all, is a mystery. As a final gesture, a seven h.p. motor was optimistically installed. Whether or not any flights were achieved in this plane, is not known.

As you see, some of the early designers must have figured that if a monoplane climbed 100 feet a minute, a triplane should climb 300 feet a minute. Maybe that wasn't the reason, but, regardless of how they arrived at the conclusion, a lot of them considered multiplane types the best.

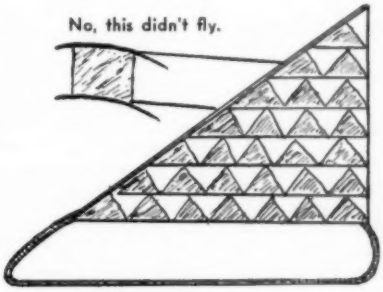
There was, for instance, the 1909 Zerbe Sextuplane, designed, as you may have surmised, by a man named Zerbe, and having six wings (ah there, Mr. Holmes). This ship had a span of 15 feet and a chord of four feet in each wing. Control was by two small fins located forward. There was nothing very radical about this plane, so it flew a little.

The same man later produced a quintuplane which was similar to the foregoing, except that it was driven by two props instead of the one previously used, and had one less wing. In this model an elevator and a keel, or elongated fin, were stuck out in front for control. Some really excellent flights were made by this plane.

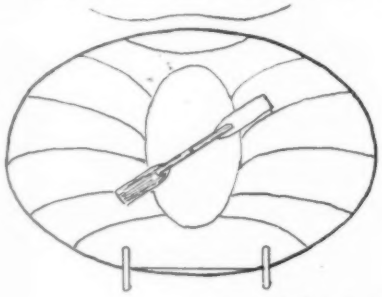
Then there was another fellow, Mr J. W. Roshon. This gentleman was born in Harrisburg, Pa., and, while there, or perhaps at some other burg, he saw a skyscraper in the early stages of construction. Now this impressed him greatly. "There," said he, "is the ideal design for an airplane!" The mere fact that no one seemed to agree with him did not deter him. He went to work and built himself 26 small wings. Then he riveted them together just the way he remembered the skyscraper looked. When completed the plane had a span of 23 feet and a height of 16 feet and looked just like a lot of scaffolding. He installed a seven h.p. motor and one fine day in 1909 took it out to the field to test.

The sad part of this tale is that nobody seems to remember whether or not it flew. Perhaps they laughed so hard that they couldn't see it. Let's be charitable and just skip that part.

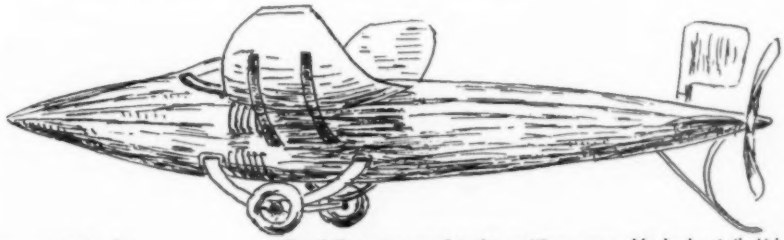
Since the beginning of time, man had



No, this didn't fly.



Aviation, it seems, went in for hoopskirts, judging from this one.



This fellow appeared to be getting warm. He had a tail skid, landing gear, braced wing, rudder and a prop back in the tail.

watched the birds soaring on the invisible currents of the air, and had dreamed of being able to emulate their feats. With almost no exceptions their minds could not picture any other means of flight than that which the birds used so successfully—by flapping their wings. The legend of Icarus and Daedalus can be taken as the first example of attempted flight even though it is only a myth.

Marco Polo reported that while he was at the Chinese court an acrobat gave an intended exhibition of flying, by the use of a loose robe forming a sort of web from his arms to his feet. He jumped from a high tower and achieved only a vertical descent. A similar stunt was tried by a sorcerer in the Coliseum with identical results.

Leonardo Da Vinci was perhaps the first man to tackle the problem of flight in a scientific way. He studied bird flight, and designed a plane which was to use flapping wings to be worked by industrious manipulation of the arms and legs. He was not so foolish as to try the experiment, however, evidently not having much faith in the device.

At any rate, it can be seen that a line of thought which had continued through centuries was not likely to be dropped, even in the face of the wonderful success of the other school of thought as started by Sir George Cayley, in the early 1790's, that of driving a fixed surface through the air by external propulsion.

So experimentation with ornithopters went, and still goes merrily (and quite unsuccessfully) on. Most of the ornithopters were designed along the same lines and since none has ever achieved any flights, we will describe but one, a typical machine.

This was the *Twining Flapper*, designed and built by H. la V. Twining, president of the California Aero Club. It had a 26 foot span and weighed only 100 lbs., minus pilot. There was no rudder and no elevator, the pilot hoping to control the ship by the simple expedient of leaning forward to dive and backward to climb, while he flapped the wings by means of pedals, á la bicycle.

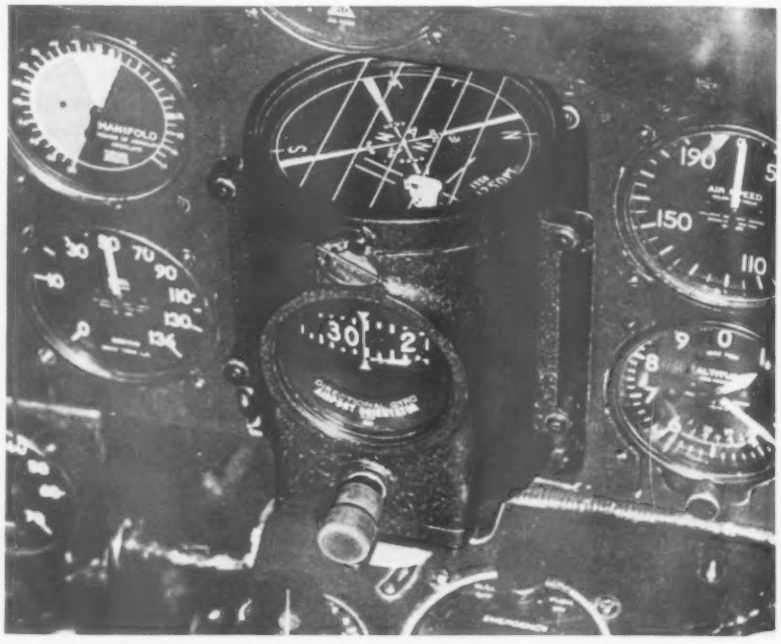
A pull of 850 to 1,000 lbs. on each wing was claimed, but evidently falsely so. At any rate on completion in October, 1909, the machine was found incapable of flight. With the pilot pedalling like mad, the plane taxied beautifully on its three-wheeled carriage but declined to rise, fortunately, I am forced to comment, for the pilot. We can picture him frantically leaning back and forth, like a person doing setting-up exercises, trying to keep the darn thing in the air once it did get there.

And then there were some who believed in the ornithopter principle, but perhaps perceiving the mechanical difficulties encountered by builders of the usual type, decided to try something original. Or maybe they just wanted to be different. Well, anyway, just take a peek at the Geisler *Ornithoplane*, as good an example of something or other as these myopic eyes have ever seen.

This little beauty which was built in 1909

(*Concluded on page 74*)

The Stark Airport Orientator



This is the original installation of the orientator in the cockpit of a Boeing 247D.

WHAT promises to be a great boon to the airline pilot is the airport orientator invented and constructed by Horace Stark, a Pennsylvania-Central Airlines pilot. The instrument was made into its present form by the Sperry Gyroscope Co., makers of the directional gyro which is standard equipment aboard all airliners. Stark's airport orientator is a modification of this instrument, and the Sperry company has revised its directional gyro to accommodate it.

The airport orientator is the rotatable top dial on the directional gyro. The pilot is equipped with special round charts of each field he will use. He merely fits whatever airport's chart he wants on the dial, then flies blind into the field. On the instrument, however, he has the airport accurately mapped for him.

Questions and Answers

T. W. S., Milwaukee, Wis. I notice that all air-cooled radial aviation engines have an uneven number of cylinders, such as 5, 7, 9, and so forth, when the cylinders are all in one row. However, when two rows of cylinders are used, then the number is even, 10, 14 or 18. Why is this done?

ANSWER. When the cylinders of a radial engine are all in one row, an uneven number of cylinders is necessary in order to complete the firing order in two revolutions. Two complete revolutions are required for completing the cycle of a four-cycle engine, hence, during the first revolution, all of the even number cylinders will fire and during the second revolution all of the uneven numbered cylinders will fire, thus completing the series of events. For example, a nine-cylinder radial will have the following firing order:

1—3—5—7—9—2—4—6—8

If you sketch out a nine-cylinder diagram and then, starting with (1), and skip two cylinder spaces at a time, you will find that you will complete the two trips around the sketch as indicated above ending at (1). A two-row radial can be considered simply as two single-row engines placed side-by-side, using two crank-throws.

* * *

F. F. G., Butler, Pa. What advantages has a wood frame airplane compared to the present all-metal type? Is the metal type safer than the wood ship when we consider fire?

ANSWER. Spruce, strength for strength, is lighter than steel tube construction, providing the fittings are reduced to a minimum. I, at this point, wish to call your attention to the fact that wood wing structures have been employed for many years, even with the rest of the plane of steel tube construction.

Wood is flexible rather than elastic, therefore wood damps out vibration more effectively than steel because of the internal friction of the material particles. For the same reason, wood does not transmit vibration to any extent and this is a notable advantage. So far as the fire

(*Concluded on page 90*)

ARCTIC Adventure

by WALT BOHRER

When men get lost up in the Arctic there's no Travellers' Aid to come to their rescue. Some never come back. Some owe their lives to airplanes.

OF the many sagas of the far North that has enriched the lore of human heroism and thrilling adventure, one of the most outstanding in recent years was the rescue by airplane of 22 members of the crew of the steamer *Baychimo* caught in the ice at a lonely spot near the top of the world, far above the Arctic Circle and but a few miles south by west of Point Barrow, Alaska.

Despite the fact that rescue itself took place in 1932, some say the ship still drifts about in the tide-driven ice-floes, a veritable "ghost ship" of the northern seas; some say she has since been rediscovered, boarded and once again abandoned to her fate, while still others believe she has long been crushed and sunk. However that may be, the facts of a 700-mile series of flights, during the rescue, by three daring Alaskan aviators over high and rugged mountains between Nome and the *Baychimo* with no landing fields to mitigate any possible mishap en route, constitute a story that may one day become legend.

The *Baychimo*, a fur ship of the Hudson Bay Company became ice-bound as she was returning with furs from an expedition into the Arctic. Apparent that she was "in" for the winter—a long winter, too, intense with cold and hardship—and with only a limited time left to get her crew "outside" before the real and long-enduring blizzards set in, hasty arrangements were made for a relief expedition. The situation was not encouraged any by the fact that supplies were running low. The ship's radio flashed news of its plight to Nome, and preparations were hastened for the rescue. The last boat out was scheduled to leave Nome for the south in a few days restricting the time allowance for the rescue. The only means by which connections could be made would be by airplane. And by airplane it was.

Hans Mirow, Vic Ross and Chester Brown, then of the Northern Air Transport, to whom the contract for the rescue had been let (and today widely known Alaskan air veterans), were the pilots who undertook the task. Theirs was the responsibility of flying for hours over rugged and desolate country where few venture either by foot or plane—country where, for hundreds of miles at a stretch, safe landings are out of the question.

Here is the "Baychimo" photographed from the plane that came to rescue the crew.

Mirow, Ross and Brown remained in the air eight hours daily when weather permitted. They worked in two sections—one from the *Baychimo* to Kotzebue, and the other from Kotzebue to Nome. Kotzebue was used as a base, with two planes carrying passengers to that point from the ship. The third plane transported the "rescued" the remaining distance to Nome.

Three Stinsons were outfitted for the work with winter flying equipment. Equipment included heating pots for the motors, cowlings, tarpaulins and other protections to prevent freezing. Fur clothing, snowshoes and emergency rations were taken along.

The route, approximately 700 miles, was from Nome to Kotzebue and then along the 162nd meridian of longitude to the ship. Wainwright, a small trading post, was on the line of flight.

The *Baychimo* with its load of furs lay in a vast field of ice about a quarter mile from shore. Not far away, in a sort of lagoon, a snowfield almost a mile in length provided an ideal landing field.

Two planes made the first trip from Kotzebue to the ship where they were welcomed by the entire crew. Copies of *The Nome Nugget*, Nome's famous daily, were taken to the men giving them the first news they had seen in many months. Carrying seven men, their baggage and the ship's records, the two Stinsons returned to Kotzebue the same day.

For the ensuing three days a terrific blizzard held the boys on the ground, causing anxiety because of the proximity of the steamer Victoria's sailing from Nome. The weather had hardly cleared, however, before Mirow, Ross and

Here is the rescue airplane (a Stinson) with some of the rescued and their rescuers. Hans Mirow is standing on the wheel closest the camera. Note ship in background.

Some of the "Baychimo's" crew is shown beside the airplane that rescued them.

Brown were in the air again making a second trip to the *Baychimo*. The average temperature on these flights was reported to be about 15 degrees below zero.

Adventures were many for the boys on these flights, for adventures are many in Alaska. On one trip the pilots sighted large herds of reindeer and caribou. On other they saw what they took to be the figure of a man but which, on closer investigation, proved to be a huge brown bear. Both planes swooped low to have a look at bruin and, although they were 100 feet or more in the air, the huge beast made desperate passes at them with his immense paws, standing on his hind legs to do so. His courage failed, however, when Mirow and Ross made a second low dive. Looking puzzled and scared, he took to his heels, stumbling all over himself in his rush to get away!

Between the *Baychimo* and relay point of Kotzebue, the intrepid flyers found the mountains like so many ice cones which had been inverted and spotted all over the country. Even the low mountain passes forced them to fly at altitudes of between 8,000 and 9,000 feet.

On the return leg of the second flight, eight passengers and their baggage was taken to Kotzebue. On the following day they were flown to Nome by Brown in two separate flights. The third trip to the ship was without incident, the planes leaving Nome in the morning and arriving at the ship late in the afternoon. There the pilots remained overnight. The next day they took off with seven more passengers—or crew members—who were flown through to Nome that day.

Thus, in smooth, comfortable fashion, the 22 men of the *Baychimo* crew were flown from a lonely and remote spot in the Arctic to Nome where they were again reunited in time to catch the last boat for the "outside"!

To Hans Mirow, Vic Ross and Chester Brown it was just another emergency job done to the best of their ability, as speedily and efficiently as possibly. All of which again demonstrated the efficiency of a service that has been making itself indispensable to the citizens of that great territory of Alaska.

Shanley to C-W

F. R. SHANLEY, widely known as the author of several Department of Commerce aeronautical bulletins, will take over the duties of chief engineer at the Curtiss-Wright Technical Institute of Aeronautics.

Shanley goes to Curtiss-Wright Tech from the Consolidated Aircraft Corporation where he has been in charge of structural development work. He will retain a consulting connection with the San Diego firm.

Until recently, Shanley was in charge of the technical branch of the Bureau of Air Commerce, a division of the present airworthiness section.

Yankee Ship Shot Down in China

Presumably the victim of Japanese fighters, this Spartan dived into a river.

DON'T let the striped tail fool you. The Chinese air force uses the same design as that of the United States Army Air Corps. But the colors are different. Actually American, though, is the airplane itself. Though the Roosevelt neutrality law strictly prohibits the sale of warplanes to "warring nations" this Spartan is but one of many types of American ships being used against the Japanese. Just how these high-speed American aircraft (this Spartan shown above actually is just a commercial machine converted by the Chinese) get into China is a matter of conjecture. Surely, the manufacturer would not openly defy the neutrality law. But it might be handled something like this (we're using our imagination now):

Suppose, for instance, a South American visited the United States to purchase aircraft, presumably for his own uses. It is perfectly legal to sell to him, for his country is not a warring nation. So we'll presume that the South American does buy two, six or a dozen airplanes for whatever purpose he sees fit. The perfectly legitimate deal is closed. But the chances are good that the American seller doesn't realize that the South American turned right around and sold the still-unused airplanes to willing Chinese buyers. So far as we know, everything is perfectly legal. Consequently, the airplanes shipped from a South American port for China are as likely as not to be American aircraft. Planes of American manufacture are highly coveted in the current wars both in China and Spain.

Warplane Contracts in '37

DURING the calendar year 1937, announcements were made by the War Department of the approval of the award of contracts for new airplanes for the Air Corps, as follows:

February 25: To the Sikorsky Aircraft Corporation, Bridgeport, Conn., for five S-43 Amphibian airplanes, and spare parts equivalent to one complete Amphibian plane, at a total cost of $633,-898.00.

March 2: To the Kellett Autogiro Corporation of Philadelphia, Pa., for six Autogiros, complete, with spare parts, at a total cost of $238,482.18. The purchase was made following exhaustive tests by the Air Corps in conjunction with the Infantry, Artillery and Cavalry during approximately 18 months, using the models from several Autogiro Corporations.

April 10: The contract heretofore made with the North American Aviation for basic training planes was increased by a total of 73 planes and a complement of spare parts at an additional cost over the original contract of $903,380.99.

June 2: To North American Aviation, Inglewood, Calif., for 85 Basic Combat planes and the equivalent of 10 additional planes as spares, at a total cost of $1,,372,355.00.

June 10: To the Douglas Aircraft Co., of Santa Monica, Calif., for 177 two-engined Bombardment airplanes, together with necessary spare parts for same, in the sum of $11,651,948.

July: To the Boeing Aircraft Company, Seattle, Wash., for 10 more B-17 Bombardment planes, the contract including an option for three additional Bombers, making a total of 13 on this order, and an adequate complement of

(*Concluded on page* 73)

A Model Compressed Air Engine

by JAMES P. EAMES

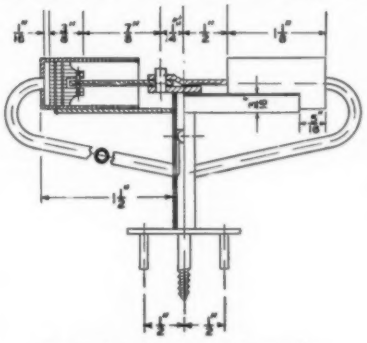
Here is something new for the model fan. The author, a prominent aeronautical engineer, has chosen a novel, interesting subject for an experiment. Take notice, you gas model builders.

POWER plants driven by means of compressed air have proven ideal for the propulsion of model airplane structures since, no component member being subjected to excessive stresses, a remarkable degree of lightness may be incorporated into their construction and, in addition, an extremely low operating expenditure is identified with their sustained employment.

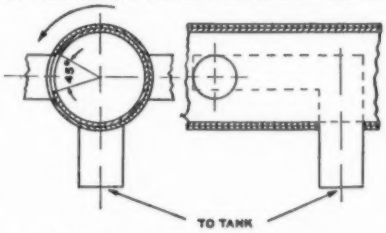
The engine described here is of the horizontal opposed type, the dimensions of the cylinder bore and stroke being one-half inch by one-half inch. The compressed air tank which feeds the power plant may be constructed so as to be adaptable to individual designs of airplane models, and suitable to individual constructors' performance requirements. It might be said that the performance characteristics of a compressed air engine are dependent to a large degree upon the tank design and capacity, since such factors as horsepower output and operating rotative speed become relative to the pressure and volume of the working medium available at the intake side of the engine cylinders. Under practically any combination of operating conditions, however, our engine would be capable of swinging a 12 or 14 inch propeller, and sustaining in flight flying models of four to five feet of wing span.

The cylinder members are constructed of steel tubular section. The standard wall thickness for the section employed approximates 1/32 inch, although the section may be turned down to effect the attainment of a thinner wall, lightness wherever possible being of course highly desirable. A row of six 1/16 inch holes, drilled around the bottom end of the cylinder members at the extreme lower limits of the exhaust stroke, serve to effect the release of the pressure built up by the expanding air during the latter stages of the power stroke. The intake manifolds are constructed of ⅛ inch steel tubular section. To facilitate bending of these members as required, the section is first cut to the proper length and then annealed. This condition is amply indicated when the tube assumes a dark red color, at which point it is plunged into cold water. Upon immediate withdrawal it may be readily bent around a piece of standard stock to the required dimensions. While employing this method of bending, the constructor is cautioned against further heating of the section beyond the prescribed dark red color, since subjecting the metal to temperatures in excess of that thus indicated causes brittleness with consequent easy breakage. An alternate method of bending tubular section consists in filling the interior of the section with melted rosin, cooling, and then bending as before around a piece of standard stock to the required dimensions. The ends of the intake manifolds are soldered to their adjoining members.

The crankshaft members is formed of standard ¼ inch steel tubular section which rotates within a similar section of slightly larger diameter. This outer section serves the dual functions of a sleeve-type bearing for the rotating shaft and admission ports for the intake valves. The intake valve assembly is illustrated in Figure 1. A vertical slot is cut around the crankshaft joining a horizontal slot cut at right angles to it and extending forward from the air intake riser at the rear end of the crankshaft to make contact, at the properly predetermined time, with the intake manifold leading to the cylinder that is in the firing position, thus admitting air to the cylinder head. The width of the horizontal slot is made such that the engine operates at one-quarter cutoff; that is, the intake air is cut off or restrained from entering the cylinder when the piston has travelled one-quarter of the length of its designated stroke, the expansion of the air already within the cylinder performing sufficient work to force the piston down through the remainder of the stroke thus completing the cycle of operations. Since the angular movement of the crankshaft corresponding with the entire length of the piston stroke represents 180 degrees, one-quarter of the stroke represents 45 degrees of crank travel as designated in Figure 1. To accentuate clarity of detail, Figure 1 is not drawn to scale. A single horizontal slot suffices for the firing of both cylinders since, the firing sequence being 180 degrees, the slot uncovers the admission port of one cylinder 180 degrees after closure of the admission port of the opposite cylinder. Crankshaft fits and clearances become highly important with this type of air distribution system due to the fact that the crankshaft interior is at all times filled with air and it is, of course, desirable to minimize as far as possible losses due to leakage. The original dimensions of the valve slots should be preserved to an extremely accurate degree since the power output of the engine, and its overall operating efficiency, are drastically affected by the admission of the intake air either too early or too late.



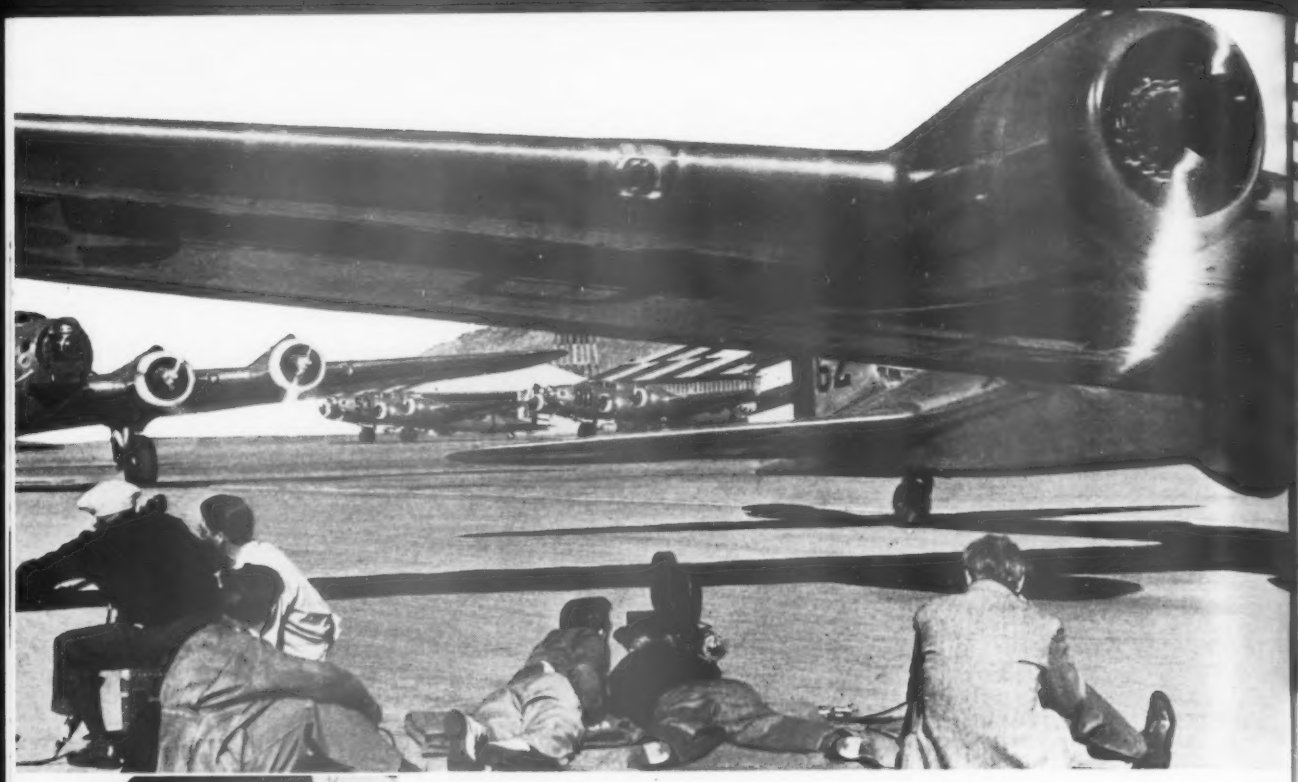
A top-view drawing of the engine.



This is the engine's simple air valve.

For piston construction, fiber apparently becomes the best material combining, as it does the most adaptable strength and lightness characteristics. Two compression rings are provided to minimize blow-by of the incoming air. Below the piston skirt the member is turned down to the form illustrated in Figure 3 to function as the bearing for the piston pin and to accommodate the small end of the connecting rod. For clarity of detail and convenience to the individual constructor, the plan and elevation working drawings are made somewhat larger than full scale. The dimensions in all drawings are in inches.

Assembly of the detail components is effected by soldering the propeller hub member to the forward end of the crankshaft, working with great care and accuracy to insure a close fit thus minimizing the air leakage through this shaft connection; the connecting rods, which are formed of standard 1/16 inch steel stock drilled and bent as indicated in the working drawings, are attached at both ends in the conventional manner, the single crank throw being soldered to the rear end of the crankshaft care being again exercised to secure a close fit; the entire assembly is maintained in place by a sheet metal strip extending across the forward end of the power plant and around a sufficient proportion of the cylinder circumference to insure rigidity of the assembly under operating conditions. This strip is soldered at the points of contact with the cylinder members, and at the juncture of the crankshaft tubular bearing.



Cameramen and sound technicians sprawl flat as Army men taxi bombers over them.

TEST PILOT

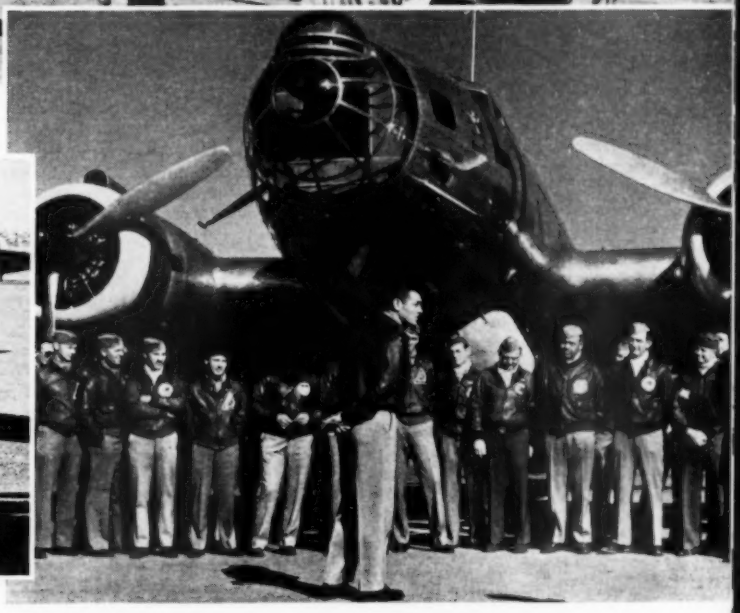
HOLLYWOOD returns to aviation films with a flourish with at least two major films under way, one of them Metro-Goldwyn-Mayer's "Test Pilot" illustrated on this and the opposite page. From the pictures shown here, some idea as to the amount of cooperation given the movie by the Army Air Corps can be had. Unlike Paramount's "Men With Wings", also to be released soon, "Test Pilot" deals with modern aviation, stars Clark Gable, Myrna Loy and Spencer Tracy.

"Pilot" Clark Gable offers a striking contrast to the rudder of a B-17 "Flying Fortress".

Gable, Loy and Tracy rest between shots beside an Army fighter (Seversky P-35).

The scene being shot (above) is of the group of officers approaching the cameras. The ships are Boeings and Northrops.

Tracy, Gable and Lionel Barrymore discuss scenes from their picture with GHQ Air Force officers (note sleeve insignia).



Clark Gable issues flight orders to Army airmen—for film purposes only. Pilots and aircraft from Langley and March Fields are in the picture.

A Hamilton Field Douglas B-18 "poses" a take-off for the camera.

Atlantic Service Soon?

THIS trans-Atlantic airline business is coming back into the foreground after a short lapse following recent test flight by British and Americans between England and New York. A conference was held recently in Dublin, Ireland, at which representatives of the United States, Great Britain, Canada and Ireland, surveyed the successful flights over the Atlantic made during 1937. The many problems of international commercial ocean flying were discussed and plans laid whereby the operating companies involved, and their respective governments, will carry out their part in operating the international service that is expected to open soon.

It was pointed out at the conference that it probably would be quite possible to open trans-Atlantic mail and passenger service within a few weeks, so far as the necessary ground equipment for safe operations was concerned. However, aircraft capable of carrying a suitable commercial payload have not yet been delivered to the ocean-flying companies. Ships capable of carrying up to a 5,000 lb. payload already are being built both in the United States and Great Britain. The American four-engined Boeing flying boat is nearing its first flight test, while in England a modified four-engined flying boat similar to the *Cambria* and *Caledonia* (the type now used by Imperial Airways on its New York-Bermuda line) has been started.

Meanwhile, Britain's "pick-a-back" airplane is being groomed for the first 1938 British trans-Atlantic hop. The upper half of this ship (*Mercury*) will be launched in mid-air over the Irish coast and will make the flight to Newfoundland. It will make the return trip with a reduced load, because of the absence of its "mother" plane, the *Maia*.

Free Air Schools

THE State of Tennessee has taken the most forward step to further private flying for the airminded-man-on-the-street of any state or federal authority in recent years. Major Walter Williams, director of the state aeronautics board as well as the commanding officer of the aviation division of Tennessee's National Guard, recently announced the purchase of five lightplanes (*Cubs*) which will be used in conjunction with the five state-operated ground and flying schools throughout the state.

Enrollment in each of these five schools, originally set at 500, had to be raised due to the tremendous interest in flying expressed by air-minded Tennesseans. At the present time nearly 3,000 persons are enrolled in the Tennessee ground schools alone. The 15 top students in each school —a total of 75—will be given free flight training in the *Cubs* to the extent of a private pilot's license.

A Four-Year-Old Airman

LICENCE 1.

LICENCE.

Photograph of Holder.

Signature of Holder Eric G Morris

This Private Pilot's Licence No. 00000
dated 22nd July 1937
has been issued to Eric Ainslie Morris
who is hereby licensed to fly the types of flying machines referred to on page 2 of Licence, subject to the special conditions contained herein.

This Licence is valid until 31-12-2000
Given at Melbourne this 22nd
day of July 1937
(Signature)
Secretary, Qnsl. Aviation Board.

LICENCE 2.

LICENCE.

Particulars.	Description.
Surname	Morris
Christian Names	Eric Ainslie
Nationality	British
Place of Birth	Geelong
Date of Birth	3-3-1933
Address	31, Carnarvon Road Essendon W5

Types of Flying Machines referred to on page 1 of Licence:— Flying Flea

Initials of responsible officer.

BECAUSE he expressed such a great liking for aviation, four-year-old Eric A. Morris of Melbourne, Australia, was presented with the "honorary" pilot's license shown above. Biggest reason probably was the miniature "Flying Flea" he is shown with.

Nonetheless, young Eric went through the routine requirements to get the license. We should hasten to point out, however, that Eric's license is "subject to the special conditions contained herein" which implies that young Eric's "flying" is confined to the backyard antics of himself and his 2½-year-old brother Howard who serves as "mechanic". They are shown above with Howard about to "twist her tail".

Canadian Forests Air-Mapped

WITH one-third of the total forest area of Canada surveyed and photographed from the air, forestry experts in the future will save themselves and their firms much hardship and money, by consulting these aerial photographic maps of Canada's forests.

Over 400,000 square miles of forest have been photographed from the air, the bulk of the work having been done by the Royal Canadian Air Force. Private flying firms and provincial governments have covered 70,000 square miles.

With a forest area of 1,254,000 square miles in extent in which transportation on the ground is arduous as well as expensive, making a forest inventory is a big job. Using airplanes practically every locality is accessible for observation and photography, while good maps can be made from the information available on aerial photographs.

Photographic planes used in Canada can cover 450 to 700 square miles an hour, obtaining clear photographs showing the region to the horizon. Vertical photographs cover from 100 to 200 square miles in an hour's flight, dependent on the plane's and camera's speed. The countless lakes scattered throughout most of the forested regions provide landing places for pontoon-equipped ships in summer and ski-equipped planes in winter.

Air photography provides greater detail than can be secured from even quite extensive land surveys. Every turn in the streams and shore lines, every road and cut line is accurately located. To the forester they provide not only an accurate map of the areas showing the various tree types, their age and density, but also a means of estimating the volume of timber within a reasonable degree of accuracy for inventory purposes. again, this time the motor sounding nice

Air photographs are now being used by operators for laying out cutting operations, locating roads, logging camps, dams and other land and river improvements necessary for the extraction of the timber. The photographs are also used by mining engineers, hydro-electric and land classification engineers.

Altogether the Dominion government has available for use by anyone interested in the natural resources development of the Dominion photographs of 713,700 square miles of forests, mining regions, cities, towns and rural regions in a library at Ottawa.

HELIUM FOR SALE

by WALTER D. SHACKLETON

All future lighter-than-aircraft will have access to one of Uncle Sam's greatest of natural resources—fireproof helium.

These are valuable tanks of helium gas stored in the government plant at Fort Worth. Each of these holds 178 cubic feet. The "Hindenburg" held 3,700,000 feet.

UNCLE SAM is about to tack up a shingle bearing three little words marking a milestone in the annals of aviation. That sign will read:

"Helium for sale!"

Government agents are now completing final details in a program authorized by Congress for putting helium on the market. In so doing, Uncle Sam will not only end this country's 32-year monopoly of the mysterious gas, but will climax a hitherto untold story that began in England during the World War when German Zeppelins rained death on London.

As the last step in the program which precedes the actual sale of helium, the government is now completing negotiations for purchase of helium plants at Dexter, Kansas and Thatcher, Colorado—the only privately-owned ones in the country. Immediately after this transaction, the government is authorized to begin sale of helium produced at its own plant near Amarillo, Texas. In reserve are two undeveloped helium properties in Utah.

Lifting the ban on private purchases of helium both here and abroad for civilian aviation, scientific and medical uses, focuses attention on a sealed chapter in world history. Helium has inspired secret foreign missions and anxiously guarded conferences, for it was a mysterious "X-factor" that was booted around the U. S. A. for more than a decade before its almost incalculable value was pointed out by representatives of another nation.

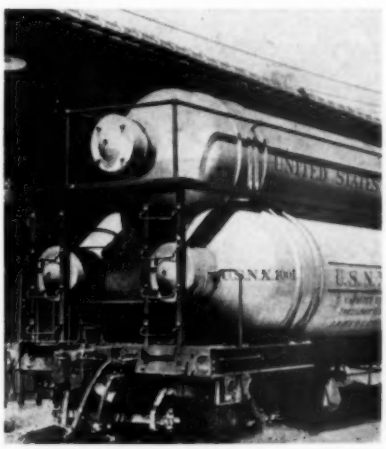
Mystery surrounded even the original discovery of the element helium, it is recalled. The English astrophysicist, J. Norman Lockyer, marked the presence of a previously unnoticed line in a spectroscope study of sun rays in 1868. Lockyer was mystified by this line, which was later identified as the first evidence of the presence of a new element. Eventually scientists produced helium in a laboratory through a complicated treatment of certain minerals, not realizing that it was present as a gas in subterranean chambers.

From the sub-strata of Texas at Amarillo, less than 500 miles from New London, where last March 456 school children and teachers perished in an explosion of Texas natural gas, this totally different and non-inflammable gas called helium is obtained. It is one of the most inert elements known, not entering into combination with oxygen and other elements, and its weight is less than one-seventh that of air. Only eight per cent less buoyant than the highly explosive hydrogen, helium is ideal for use in lighter-than-air craft.

Authorities studying the curious existence of both helium and inflammable gases in virtually the same strata attribute the presence of helium to the breaking up of radioactive minerals of the earth. Its recovery is extremely difficult. due to the meager amount of helium present in other gases which are removed by subjecting the mixture to extremely low temperatures and very high pressures under which conditions other gases liquefy, leaving helium in recoverable form.

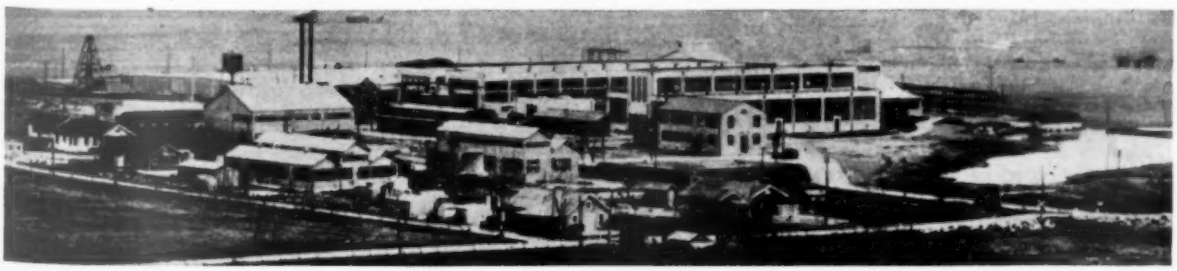
Only a few decades ago, when modern production methods had not yet been perfected, the cost of one cubic foot of helium was approximately $2,500. Now however, it is anticipated that the government will be able to place helium on the market at $10 to $15 per 1,000 cubic feet—a sharp reduction from the price of $150 for the same amount produced by the private concerns being acquired by the government.

The first in the series of strange events which led to this country's monopoly of helium occurred immediately after the development of a special incendiary bullet by a British inventor, for the explosive missiles not only protected London from



The cylinders of this tank car are 40 feet long. Each holds 200,000 cubic feet.

Ninety per cent of the world's helium is produced at this plant at Fort Worth, Tex.



German airships filled with explosive hydrogen, but acted as a boomerang which threatened to wreck the whole British plan of air operations. Poised in hangars made ready for raids in retaliation for the German air bombardments, were three British dirigibles, built at a cost of $25,000,000.

The British airships, however, like the German zeppelins which had been driven from the skies over London, were filled with explosive hydrogen. Hearing that the German high command had already developed an incendiary bullet to match their own, the authorities in the British Foreign Office began a desperate search for a non-inflammable gas with which to fill the dirigibles.

Reposing in the archives of the British Admiralty was a report that a mysterious lighter-than-air gas called helium, which would not burn or explode, had been discovered in the United States, and a secret mission from the Admiralty, led by Commander Bridges, was immediately dispatched to America.

Members of the mission quietly entered this country and called on Secretary of the Navy Daniels, offering in their determination to get helium at any cost, to develop the then unimproved and scarcely known sources of the element in Kansas and Texas.

A quick investigation revealed that the presence of helium had been discovered in a Kansas gas well as early as 1905. It also showed that despite a flood of letters from gas well drillers who were sure they had discovered new sources of the mysterious element, little or nothing had been done to develop this natural resource, and almost no thought had been given to its immense military value as a non-explosive gas for airships.

In the hectic winter of 1916-17, inventors by the dozen were bombarding Washington with short cuts for winning the war and it may have been more than a coincidence that the high mission on helium was referred to a man, who, seven years before, had been forced to say "yes" or "no" to another British proposal which subsequently revolutionized automobile transportation in America and ushered in the new high-speed era.

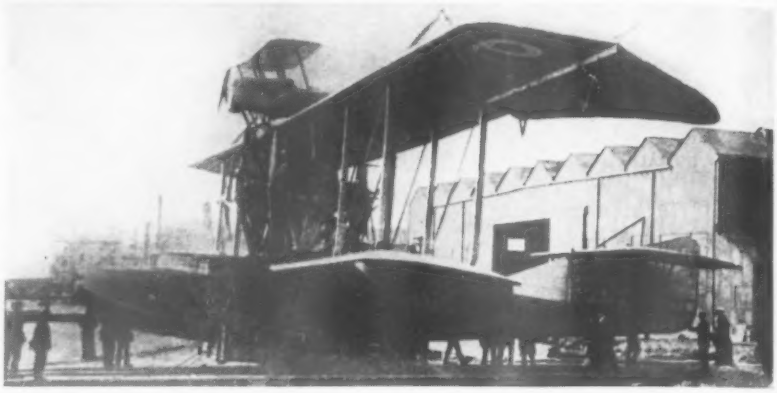
This man was Arthur Hudson Marks, now vice-chairman of the board of the B. F. Goodrich Company, who had volunteered for war service with the Navy Department's Bureau of Construction and Repair.

In 1908 Marks, already a dominant figure in the rubber industry because of his scientific contributions to manufacturing processes, had said yes to that other British proposal and by his answer gave America the cord tire which had been pioneered in England. On that occasion Marks was given three hours to transform the British brainchild into a boon for the American people.

Now, in the winter of 1916-17, he was called upon to make another lightning decision of far-reaching importance to another branch of transportation, a decision which will be recalled as America

(*Continued on page 72*)

From Felixstowe to Robert Mayo



England's present "pick-a-back" airplane is not a brand new idea by any means. It is just a modern version of the flying boat above with the Bristol "Bullet" on top.

THAT there is nothing new under the aeronautical sun has been proved repeatedly from time to time during recent years. About everything possible or impossible has been designed, built or suggested in the line of aircraft years ago, and the only improvement yet to come will be a radical change in the whole matter of aviation.

This statement has been awakened by the breathless public interest in the failure or success of the Mayo "pick-a-back" plane now under test in England. Even men engaged in the aviation industry, and who should know better, acclaim the Mayo arrangement as a brand new sparkling idea in aviation when, in fact, it is nothing of the kind, as the accompanying photograph will prove. And just as a matter of interest, we show the U. S. patent brief, issued December 7, 1937, to Robert Hobart Mayo of London.

'Way back in the wartimes, we do not have the definite date, a "pick-a-back" venture was made in England with a flying boat as the bus and a scout plane as the rider. The accompanying photograph shows this ancient combination of a Bristol *Bullet* which was launched from a Felixstowe flying boat. This old photograph is somewhat dimmed by time, but the little Bristol fighter can be seen perched on the upper wing from which it is released after the boat gets up to flying speed.

Just how this early experiment turned out, we do not know, but it was probably made in 1918 or 1919. It is interesting to note, from the patent, that the "upper component" can be fed with fuel or "nursed" after leaving the "lower component". *(We wish to thank Rummler, Rummler & Woodworth, patent attorneys, for this abstract.)*

2,101,743
AIRCRAFT
Robert Hobart Mayo, London, England
Application February 16, 1937, Serial No. 126,047
In Great Britain March 24, 1936
3 Claims. (Cl. 244—2)

1. A composite aircraft comprising in combination a lower component carrying a relatively heavy load of fuel, an upper component mounted on top of the lower component and carrying a relatively light load of fuel, locking means which secure the two components together but are releasable to enable the upper component to separate from the lower component during flight, and a fuel-transferring connection between the two components which continues to interconnect them after release of the locking means, and enables fuel to be transferred from the lower to the upper component after the two components have separated.

What an Angry Pilot Thinks

THIS Army pilot in Washington, D. C., gritted his teeth and growled deeply one day recently when he received a copy of one of the Air Corps' innumerable official orders that smacked largely of "just some more red tape". He angrily drew up the following list of "regulations" which he thinks the Air Corps might just as well put into effect, considering all the other red tape now in the book:

"In case of engine failure or other minor trouble such as the loss of wing or wings, loss of propeller, etc., the following procedure will be carried out:

"A. Remove all loose radio equipment and tools.

"B. Ask pilot for Form 1 and fill out same.

"C. Send radiogram to corps area headquarters requesting permission to make emergency parachute jump.

"D. Check altitude and position, being sure to include this information in abovementioned radiogram.

"E. Make list of the best telephone numbers in the vicinity.

"F. Notify pilot that you are ready to jump.

"G. Jump."

How to Rig a Light Biplane

by CONRAD J. MORGAN

Here are some invaluable pointers for you plane-builders. To rig a biplane correctly always has presented an extremely difficult problem to the free-lance builder.

THE object of this article is to acquaint you with some of the many tricks used in rigging. These suggestions are not intended to take the place of instructions issued by the factory but are for fellows who are building their own ships and also for those who have ships but no rigging instructions.

The incidence of the wings is determined by the length of the landing-gear. If the gear is short then you must have a great incidence angle. The reason is simply this; the incidence is necessary so that when the ship is standing in the three-point position, the wing forms an angle to the ground sufficient to give the wing 90 percent of its maximum lift, thus giving the minimum landing speed.

You may wonder, then, why we do not make it develop, say 95 or 100 percent of its maximum lift and reduce the landing speed still more? The reason is that the wing would then be too near the stalling angle and any inaccuracy in the rigging or other factors that may enter into the scheme of things, such as bounces and the like, would cause the wing to stall. This would of course result in complete loss of control.

If you do not know the incidence of your ship don't worry about it. Just take the incidence at the root rib of the lower wing and rig that amount into the entire ship. A wing, once it is in the air, automatically adjusts the angle of attack to meet the loads imposed upon it.

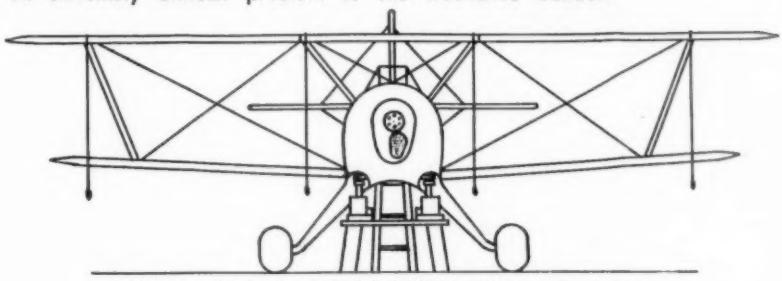
Stagger, on the other hand, is simply the disposition of the wings in front of and in rear of, the center of gravity. It gives better visibility to the occupants and increased efficiency to the wing cell.

If too much stagger is rigged into the ship it immediately becomes tail heavy because you have moved the upper wing too far in front of the center of gravity. If too little stagger is used the reverse is true. Dihedral is used as a means of applying a strong corrective force automatically to the ship once it has lost its lateral balance.

It is of utmost importance that the tail assembly be properly rigged. The horizontal stabilizer must be level and the fin vertical. Any inaccuracy here will result in a poor flying ship. The fin should be offset at the forward end to correct for torque. From one to four degrees should be sufficient, the more power the more the offset.

If your engine turns clockwise, when viewed from the cockpit, offset the fin to the left. It is good practice to rig 30° "up-movement" and 20° "down-movement" in the elevators and 30° to both sides of the rudder.

In rigging the rudder, be sure it is lined up with the fin when taking the angle. The rudder does not line up with the line of flight when you take your feet from the rudder bar, it lines up with the fin. The reason is htis; the fin straightens out the flow of air so that it leaves the fin running parallel to the fin. The rudder then lines up with this flow of air.



This is a sketch of a typical light biplane lined up for rigging.

It is evident then, if the fin is offset, that the rudder will be offset too and if your angles are not taken from this offset position you will not have enough movement one way and too much the other way.

Now as to the equipment needed. You will need a straight-edge long enough to reach from the trailing edge of the wing to a point about a foot in front of the leading edge. This straight edge must be straight.

It is a good idea, nevertheless, to show pencil arrows pointing to one of the edges. Keep this edge up at all times and your readings will be more accurate. If you can get an adjustable spirit-level protractor by all means do so. If you cannot get a protractor you will have to make dihedral and incidence boards and use a common level.

To make these instruments, take a common draftsman's protractor, a five-and-ten cent store part will do, and lay off on a board the required angle. Make these boards slightly longer than the level you intend using.

If you do not know the correct dihedral angle you can't be far wrong if you use from 2° to 4°, depending upon the amount of maneuverability desired, the more dihedral the less will be the maneuverability. If you do not know the correct amount of incidence, this can be measured after the ship is leveled in the flying position by placing the straight edge along the first full length rib from the root rib and blocking up under the level until it reads level.

Measure the height of the block and make the incidence board accordingly. You will also need four plumb-bobs and a six-foot rule or yard stick.

I will now explain the procedure followed in rigging a biplane. The same general principles are used in rigging a monoplane with this exception, the monoplane has no stagger and you do not box any wings.

Place a couple of horses and jacks under the front landing-gear fittings and take all the weight off the shock-absorbers. Place a high-horse and jack under the rudder-post and bring it up to flying position. Now, place the level across the longerons in one of the cockpits and adjust the jacks under the landing-gear until the ship is leveled laterally.

Next, place the level along one of the longerons and bring the jack up or down until the ship is level fore and aft. Check them both again. Most factory ships have leveling lugs in one of the cockpits for this purpose.

Rig the center-section first. Drop a plumb-bob between the center-section and the outer panel just in front of the front spar. Drop a plumb-bob over the leading edge as close to the ends as possible. With your rule measure the distance from the lower longeron to the plumb-bob over the end of the center section. The two sides should be within 1/32 inch of each other.

To shift the center section from side to side, loosen the cross-wire on the short side and tighten the wire on the long side. These side measurements show that the center-section is equally disposed on the two sides but does not show that it is square with the ship. To check this we measure the stagger.

From the plumb-bob that is dropped over the leading edge of the center section we measure to the leading edge of the lower wing. Both sides should be as near the same as you can make them. Any slight error here is magnified at the tips.

Care should be taken in making all measurements to see that your rule is held at right angles to the plumb-bob and to the point to which you are measuring. The incidence is now checked by placing the straight edge along the end rib of the center section and using the protractor or incidence board and level.

Any changes necessary are now made on the rear struts. Tighten and streamline all wires and check the entire assembly over again. Secure all nuts.

bolts, lock nuts and check all struts to see that they are on safely.

Now, take the plumb-bobs from between the center section and upper panels and place them on the upper wings at the outer struts, one on each side. Leave the ones over the leading edge of the center section just as they were.

Be sure that all flying wires and the rear landing wires are loose leaving the front landing wire only to support the wings. Now, placing the straight edge along the line of the front spar, put pencil marks at each end so that you can put it back in exactly the same place each time.

Set the protractor at the desired dihedral angle and *don't change it until you have completely finished rigging in the dihedral.* The reason for that is simply this; you cannot set the protractor at exactly the same reading twice in succession. If you keep changing it you never will get both sides to read the same.

After you have set the protractor place it on the straight edge. Bring the wing up, or down as the case may be, until it reads perhaps ten minutes over the desired reading.

When the flying wires are tightened it will bring it down to exactly the right reading. Use the front landing wire only in bringing in the dihedral. The rear landing wire changes the incidence too and would only have to be loosened again.

If you have an adjustable protractor the next step is to box the wings. What is meant by boxing is simply this: putting the same amount of incidence in both the upper and lower wings regardless of what it is. This is done by placing the straight edge on the bottom of the rib on the lower wing just outside of the outer struts and placing the protractor on the straight edge and adjusting it to read zero.

Place the straight edge on the upper wing in the same place and adjusting the struts so that the upper wing has exactly the same incidence as the lower. Care being taken to keep all struts reasonably short. Box both sides and don't worry if they don't read the same. After they are boxed you are ready to bring in the proper amount of incidence by rolling the wings about the lower front spar. Suppose you have too much incidence. you bring it out by tightening up on the front flying wires until the proper amount of incidence is obtained.

If too much tension is required to get the incidence you want it shows the struts are out of tram and must be changed. But before changing the strut length it is well to check the stagger. Read the stagger at the center section and then out at the struts.

If you have too much stagger you can do one of two things or a combination of the two. You can shorten both the front and rear struts the same amount or you can lengthen the diagonal thus

(*Concluded on page* 91)

the NATIONAL AIR BOARD Says...

Dr. Alexander Klemin, Chairman

ONE of the first public appearances of Dennis Mulligan following the announcement that he was to succeed Fred Dow Fagg, Jr., as Air Commerce Director, was to address the 23rd meeting of POPULAR AVIATION's National Air Board. Mulligan attended the Air Board's meeting at New York's Advertising Club at the invitation of Dr. Alexander Klemin, chairman, and took part in a timely discussion that drew considerable space in the daily press.

Two important points of great interest to POPULAR AVIATION readers were brought out by Mr. Mulligan. One is that, in face of the tremendous amount of heated criticism of the Bureau of Air Commerce's present attitude toward the private pilot, that government body is about to set up a special division of the Bureau that will deal solely with this most important phase of American aviation.

The second topic of the meeting's discussion concerned the present all-important problem of airports; airports large enough to accommodate the new super-airliners about to go into service. An outstanding phase of the United States' airport problem which Mr. Mulligan discussed was that which concerned the laxness and lack of interest on the parts of various large American communities in connection with their municipal airports.

Great interest was shown in Mr. Mulligan's frank admission that the Bureau's new Civil Air Regulations (CAR) have brought a storm of heated protests down on the heads of that federal governing body. The new Air Commerce Director frankly admitted that the many restrictions on the private pilot as well as on the schools and "miscellaneous" operators have led to innumerable and, in many cases, justifiable complaints. Mr. Mulligan announced before the Air Board, though, that he intends coping with this situation by establishing a new division of the Bureau of Air Commerce which will be specially directed to the interests of private flying and gliding. The Air Board's members, all of them prominent in American aviation, applauded this announcement.

POPULAR AVIATION has long been prepared to lead a concerted attack on the federal strangulation of private flying in this country; this magazine's files contain innumerable letters and names of those readers who have announced their willingness to back up any showdown forced on the government bureau through public opinion. Apparently, however, such action will not be necessary, judging from Mr. Mulligan's encouraging remarks before the meeting of the Air Board.

Quite as important as the private flying situation is that in connection with our airports. With this subject, Mr. Mulligan and National Air Board members dealt extensively. It was pointed out that the investment of the nation's municipalities in sites and hangars of the 4,000 airports established by them totals $350,000,000. Also, 750 additional airports have been established in the past two years. It also was pointed out that airports never even pay for running charges, much less for amortization of the initial investment. Consequently, they have become a serious burden for all but the richest of cities.

On top of all this financial difficulty and the problems of airport ownership and operation, there now has been superimposed the dread of obsolescence due to the advent of the new huge airliners that demand the finest fields with long runways. Many hitherto fine air terminals are in danger of becoming completely out of date because of this.

It further was pointed out that, because of the growing pressure of these airport difficulties, the recent National Airport Conference was called. Representatives of 50 nation-wide organizations attended this conference with the resultant demands that 1) a broad survey be made of the airport situation from a national standpoint and 2) that federal aid be given to hard-pressed air-minded communities. Mr. Mulligan spoke only briefly of the survey which, it is understood, will be conducted by the Bureau of Air Commerce at a cost of $150,000.

Though Mr. Mulligan was somewhat backward about going into detail in connection with his Bureau's airport survey, newspapermen attending the meeting managed to extract a few pertinent details that the new Air Commerce Director originally declined to speak on. In this connection, then, it was determined that one object of the pending survey will be to determine which of the existing airports merit aid, development and extension. Another aim is to determine what airports might well be eliminated without injury to commercial aviation or national defense. Another objective brought out during the questioning of Mr. Mulligan is to be the filling of the many gaps and the rectifying of the many errors in the information available to the Bureau. More accurate information concerning each field will undoubtedly be of great service to aviation. Mr. Mulligan agreed that nothing will lead to quicker aid for the municipal airport than a really comprehensive job conducted with the survey.

(*Concluded on page* 97)

ROWDY PILOT

by SELBY CALKINS

This fellow probably was flying the airplane in the air movie that left you shaking in a cold, clammy sweat.

A PILOT of faultless skill because he loves to fly; a daredevil because there's good money in it; a rowdy crackpot simply for the hell of it—That's Frank Clarke.

"Thrill 'em or kill 'em" Clarke.

He has just passed his 20th year as the premier stunt pilot of motion pictures. He has without question done more stunting, hour for hour, than any other airman in the world today—yet is probably the least publicized of all the top-notchers.

He was injured once—when he stepped off a curb and broke his ankle!

The reason for Frank's virtual anonymity is obvious. His work is before the movie cameras—and the studio moguls can't let the public know Clarke is doing the flying when Clark Gable is supposed to be, can they?

Frank Clarke's career as a stunt pilot began the day in 1918 he doubled in a plane-change for the heroine of a serial thriller. He has been at it steadily since—as boss of the flying crew in "Hell's Angels," as double for hundreds of matinee idol "heroes" in their flying roles and as one of the most expert camera plane pilots in the business.

Currently Clarke is doing much of the wild flying in "Men with Wings," Hollywood's latest aviation "colossal."

Two characteristics mark Frank as a man apart. He is as devoid of fear as a slab of granite; and he has the most outrageous sense of humor his friends have ever had the misfortune to encounter.

He spends days on end in careful preparation for a risky maneuver before the movie cameras, for he must carry out these dangerous assignments without possibility of miscalculation and with every element of danger given close consideration.

But on other occasions he has been known to take incredible risks just for a laugh at someone else's expense!

Once he victimized a whole city. . .

Omaha, staging a three-day air meet at its municipal field several years ago, brought Clarke there for daily exhibitions and billed him as the "Hollywood Dare-devil."

Other pilots on the show walked gingerly. They knew Clarke as the maddest of their reckless crew and feared the worst—even if he was one of the brotherhood.

"That rowdy so-and-so will bust this show wide open if he gets one of his loony ideas," they muttered.

Frank says his inspiration for the Omaha debacle came fullblown as he circled the airport for a landing the day before the meet. He saw that the field was bounded on one side by a screen of trees, and beyond that, the Missouri River between high banks.

"The idea hit me all at once," Clarke recalls, "and as a result I damned near lost my license."

The first day crowd was enormous . . . and Frank could hardly wait his turn. When it came he told the announcer that as a climax to his exhibition he would attempt to complete five turns of a spin—starting at a thousand feet!

That sounded impossible to the announcer (as a matter of fact it was!), but Clarke prevailed upon him to broadcast the promise nevertheless.

"You count the turns aloud—and give it plenty of 'Oh! Oh!' " Clarke admonished the announcer.

Clarke did his bit in building up to the planned climax by executing a series of rolls, loops and other hi-di-hoes all his own so close to the ground that he brought the crowd up standing. Then out of a long dive, a rolling pull-out and an inverted climb, Frank kicked his plane lazily right side up and the announcer started his stint as the spin began.

"One. . ."

Clarke's plane turned slowly.

"Two. . ."

The ship wound up a little tighter, fell faster.

"Three. . ."

Well, more than two-thirds of Clarke's altitude was gone, yet still the plane plunged spinning toward the earth.

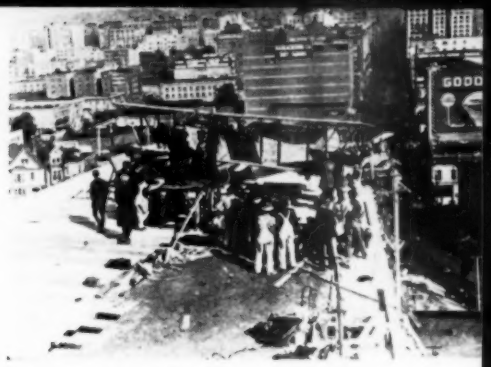
"Four. . ."

The announcer's throat tightened. He gasped something unintelligible and his voice carried a tinge of panic.

"Five. . ."

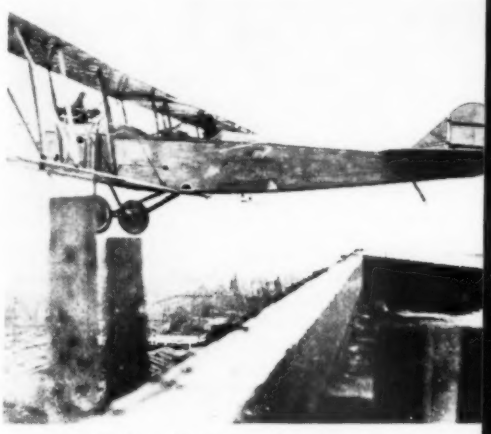
Clarke's whirling plane vanished behind the trees across the airport—and failed to rise!

"He's crashed!" someone screamed.



This Clarke episode left Los Angeles in a turmoil. The movie script called for . . .

. . . a Canuck to be flown off a building's roof. Originally, the shot was to be faked . . .



. . . but Clarke suddenly gave her the gun, sailed breathlessly close to the street . . .

. . . but finally picked up flying speed. City and studio officials cussed Frank for weeks.

"Kindly keep your seats!" blared the announcer's loud-speaker system. "Keep your seats—remain seated—SIT DOWN!—STAY OFF THE FIELD!"

His shouts, as ambulance and rescue crews raced across the airport, might as well have been whispered to stampeding cattle. Hastily reinforced police lines were powerless as thousands of spectators broke through and streamed across the field toward the spot where Clarke's plane had vanished.

Not a sign of Clarke's trim white and gold plane showed above the placid surface of the Missouri.

"God! He's in the river!" gasped the air show manager, one of the first to reach the scene.

Men scurried for makeshift draglines. Would-be rescuers commandeered boats and volunteer swimmers plunged into the water. The manager was helpless as the fast-growing crowd made organized efforts impossible.

Only a few mechanics remained at the field. All thoughts of the balance of the day's program were abandoned.

Suddenly a white overalled attendant arrived breathless at the river, tugged at the manager's sleeve and whispered a few profane words.

The manager appeared on the verge of apoplexy, but curtly he ordered the search abandoned and all hands back to the field. A few obeyed but the majority eyed the angry official as if he had gone mad and continued the search. The manager plodded sadly back to the judges' stand.

One of the judges was missing. Miles away, in a speeding car, the judge drove toward his home. In the seat beside him was Frank Clarke!

Clarke had allowed his plane to spin below the level of the tree-tops before righting it. Then he had flown away, a few inches above the river's surface and still screened by the trees, until he could turn and land almost unnoticed at the far end of the airport.

Frank was all for joining the search for his own mangled body but the one judge who had spotted his "sneak" landing halted him. The official sensed that the crowd would be furious at the hoax and spirited Clarke away.

Frank was unrepentent.

"They hired me to give 'em a thrill," he says to this day. "I gave 'em one—and was it a dilly!"

The city fathers who sponsored the air meet thought differently. To them it was a damned fool stunt that had broken up their show midway of the first day's program. They threatened to cancel Clarke's contract. They called in Department of Commerce inspectors who threatened to lift his license.

They relented only on Clarke's promise henceforth to perform strictly orthodox stunts and those at considerably greater altitudes during the next two days.

"I had to stay so high after that that all the other pilots razzed me day and night," Clarke remembers ruefully. "But the kids were worse.

(*Continued on page 92*)

Marked Progress in Air Corps Schools

An abstract from the U. S. Army Air Corps "News Letter"—

DURING the calendar year 1937, a total of 569 students (122 officers of the Regular Army and 447 flying cadets) entered the Primary Flying School, Randolph Field, Texas, for heavier-than-air flying training.

Graduating during the year from the Advanced Flying School, Kelly Field, Texas, as Airplane Pilots, were 184 students (53 officers and 131 Flying Cadets).

Ten officers and 56 Flying Cadets graduated on February 19th from the Primary Flying School, Randolph Field, Texas, and were transferred to Kelly Field for advanced flying training.

Graduating from the Advanced Flying School, Kelly Field, on February 17th, were 33 students, including 3 officers and 30 Flying Cadets.

Kelly Field played host to the band and drill company of the John Tarleton Agricultural College, of Tarleton Station, Texas, on April 21st. They came to San Antonio to participate in the competition of school military organizations during the Fiesta of San Jacinto.

A total of 62 students (10 officers and 52 Flying Cadets) graduated from the Advanced Flying School, Kelly Field, on June 9th.

Class 29-B of the Advanced Flying School graduated on October 6th, the class comprising 40 officers of the Regular Army and 49 Flying Cadets.

AIR CORPS TECHNICAL SCHOOL

A total of 803 enlisted men graduated during the calendar year 1937 from the Air Corps Technical School at Chanute Field, Rantoul, Ill., viz: 163 as Airplane Mechanics, 52 Armorers, 30 Machinists, 30 Parachute Riggers, 76 Aerial Photographers, 270 Radio Repairmen and Operators, 37 Welders, 35 Clerks, 25 Bomb Sight Specialists, 20 Carburetor and Ignition Specialists, 22 Electrical Specialists, 26 Instrument Specialists and 17 Propeller Specialists.

Officers graduating from the various courses at the Technical School totaled 36, of which 9 completed the Armament course, 10 Communications, 14 Airplane Maintenance and 3 Aerial Photography.

Early in March, a total of 32 Air Corps officers were detailed to pursue the various courses of instruction at the Technical School, commencing in the fall of the year, namely, 10 in Maintenance Engineering, 9 in Communications, 10 in Armament and 3 in Aerial Photography.

Graduation exercises for the officers' classes of the Air Corps Technical School were held on June 30th at the Officers' Club.

AIR CORPS TACTICAL SCHOOL

Graduation exercises at the Air Corps Tactical School, Maxwell Field, Ala., were held on June 1st, the class comprising 53 Air Corps officers and 11 officers from other branches of the service.

METEOROLOGICAL SCHOOLS

Meteorological service for the Army, heretofore the responsibility of the Signal Corps, U. S. Army, was on July 1, 1937, transferred to the branches of the Army utilizing this service, including the Air Corps, the Field Artillery, Coast Artillery Corps, Ordnance Department and the Chemical Warfare Service.

At Maxwell Field, Ala., a Post Signal School was started on July 8th to train enlisted men in radio and meteorological work.

Effective July 1, 1937, a Weather Department, under the supervision of 1st Lieut. Floyd B. Wood, Air Corps, was added to the list of activities at Bolling Field, D. C., made up chiefly of the trained and experienced men whose duties were previously performed with the Meteorological Department of the Signal Corps. This detachment was to be supplemented by additional men from the Air Corps.

The meteorological station, formerly located at Fort Sam Houston, Texas, was transferred on July 1st to Kelly Field, Texas, and placed under the supervision of Lieut. Elmo Mathews, Air Corps. A new office and laboratory, adjoining the Post Operations Office, was constructed for this vitally important activity.

The 1st Weather Squadron was organized on July 1, 1937, for the purpose of furnishing an adequate weather service to Air Corps units which may be located either permanently or temporarily in the Pacific Coast region.

The Air Corps Weather School at Patterson Field, Fairfield, Ohio, was opened on September 1st with an enrollment of 25 students. The purpose of the school is to teach the students the science of weather with a view to having men trained in meteorological work available at Air Corps Base Weather Stations.

NAVIGATION SCHOOLS

The 9th Group Navigation School at Mitchel Field, N. Y., resumed activities on April 5th with a new class of four student officers.

The 5th Composite Group, Luke Field, T. H., organized a navigation school for the benefit of the 18th Composite Wing, to continue during the months of July, August and September, the subjects taught covering all phases of dead reckoning and celestial navigation.

Certificates of proficiency in dead reckoning and celestial navigation were presented to a group of eight officers of the 9th Bombardment Group, Mitchel Field, N. Y., on December 10th.

AIR CORPS ENGINEERING SCHOOL

The annual commencement exercises of the Air Corps Engineering School were held at the Wright Field auditorium on June 30th. Brigadier General A. W. Robins, Chief of the Material Division, delivered the graduation address and presented graduation certificates to ten Air Corps officers.

(*Concluded on page 94*)

Propellers Without Formulae

Here is an explicit, yet readable, treatise on aircraft propellers presented by an able, well-known aeronautical engineer and designer.

by

RAOUL J. HOFFMAN

INTERESTING and most complex from the standpoint of engineering is the unit that will fly an airplane: the propeller. Its efficiency will be decisive for success of an airplane and to be sure of an efficient propeller, the order should be placed with a reliable firm that will exchange it in case there is dissatisfaction.

Nevertheless, almost anyone who can build an airplane could carve his own propeller, if a layout for this particular propeller would be available. This is especially true when propellers for low-powered engines as well as for gas model engines are in question.

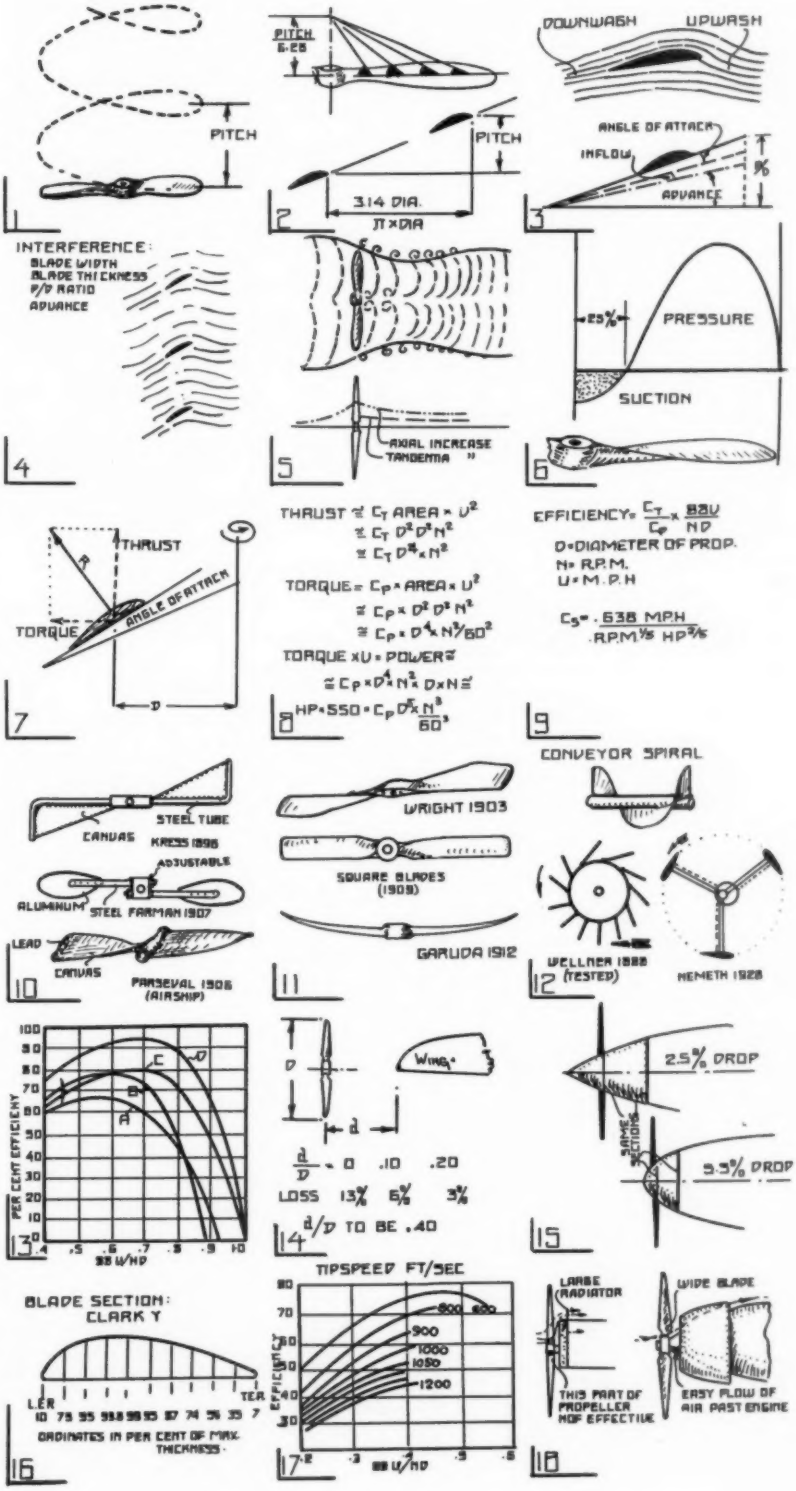
Before going into details on propeller data, the general conception of the working of a propeller will be explained.

Fastening an inclined flat plate to a shaft and rotating the shaft at high speed, a mass of air will be blown backwards; the whole unit will act as a fan. Moving a mass of air backwards a certain forward thrust is created that may be utilized to pull an airplane through the air; the fan will thus become a propeller and the actuated air the slipstream. Now, rotating the propeller so that it will slide along its flat surface, as it would move through solid material, it will advance after one revolution to a distance called pitch or more specifically the geometrical pitch. (Section 1). There will be no air moved and consequently there will be no thrust.

Developing the spiral described by the blade, as shown in Section 2, the inclined line gives the pitch angle. If the same pitch is required along the blade, angles at various stations will be determined according to upper sketch in Section 2; it shows that the angle increases toward the hub.

It is accepted that air must be blown backwards in order to have a forward thrust, and that thrust times speed is equal to power delivered, then the ratio of power delivered and power supplied will be the efficiency of the propeller. There will be one advance condition at which the propeller is at its maximum efficiency. The advance factor is expressed by 88 times m.p.h. divided by the r.p.m. and the diameter of the propeller or equal to the factor v/nd used in text books.

Comparing the drag required for a certain lift, the cambered section and the airfoil section are found to be more efficient than the flat plate; assuming that the thrust required is affected by the lift of the section and the torque by the drag then the most efficient angle the blade should be active is at the angle



having the highest lift-drag ratio. This assumption is applied to the blade-element theory, which coincides with the other propeller theories, the air momentum and the vortex theories, at their final evaluations.

Section 3 shows the airflow passing an airfoil, indicating the presence of an upwash and a downwash. This downwash gives the air a certain momentum before the other blade comes into action and it is known as the inflow. The inflow reduces the angle of attack assumed from the advance angle and shown in the lower sketch in Section 3. This interference and additional interferences are easily explained by the sketch in Section 4. They are the blade width, the blade thickness, the airfoil section, the advance factor and the pitch-diameter ratio; they are the reason for a lot of correction charts used for designing propellers.

The nature of the slipstream of a propeller is shown in Section 5. The slipstream converges after leaving the propeller; it has a retarded motion through 25 per cent of the propeller diameter and a small vortex ring at the outside of the main flow. To the varying axial velocity a tangential motion is added that gives the slipstream a slight spiral motion. This spiral motion necessitates offsetting the vertical control surfaces.

Section 6 shows the pressure gradients along the propeller blades having its highest point at 75 per cent of the diameter. This is the reason for measuring the pitch and estimating the characteristics of a propeller at this station. The low pressure at the central part of the propeller is reduced by a certain degree by increasing the pitch close to the hub.

For mathematically inclined readers Sections 7, 8 and 9 carry formulae that are used in text books. The designer will use the factor Cs, the speed-power constant, which is a function of brake horsepower, revolutions per minute and flying speed, the data used in ordering or designing a propeller.

In order to reduce mathematical operations a chart is printed that has data on a family of similar two-blade propellers and a section shown in Section 16. The center part of the chart gives the efficiencies plotted on various pitch-diameter lines, and a line of maximum efficiency; the blade layout is shown in the lower left-hand corner for the unit diameter.

To use the chart connect known quantities, starting at scale No. 1 with brake horsepower; then intersecting reference lines No. 3, 5, 6 and 8, and the line of maximum efficiencies. If the intersection point is not on a P/D line the P/D and its efficiency is determined by visual interpolation. Having found the diameter on scale No. 10, the diameter is multiplied by the P/D ratio; the result will be the pitch of the propeller, and all station angles determined according to the sketch shown in Section 2. Multiplying the blade layout by the diameter, the blade widths and blade thicknesses will be found. Multiplying all ordinates of the

(*Concluded on page* 84)

Follow the Air Corps Maneuvers on Your Radio

by T-2003

WHEN the doughboy gives his command, he follows it with "MARCH", as the command of execution.

When the cavalryman sings out his "COLUMN OF FOURS" or "TROT" he lets the command sink in, then yells a loud and lusty "HO" when he wants his troop in column or his horses at a trot.

But the army men with wings, the flyers of the GHQ Air Force have a new one, when a command is given to get into right echelon, to make a diving turn to the left by flight elements, to go after a formation of enemy bombers, or to execute any orders given over the radio.

It isn't "MARCH", it isn't "HO"; it's "NOW".

Listen in on your radio when some pursuit squadron is droning overhead. Somewhere between 6600 and 7200 kilocycles. For the exact wave length, call up the Communications Officer if you live near a regular army air field. It's great fun to sit down in a comfortable chair, twist a dial and sit in on the boys working at 20,000 feet altitude. You don't have to sip oxygen, you don't have to pay close attention to the score of dials and gauges on an instrument board; all you do is relax and visualize what's going on aloft.

One arm-chair tactical fan, who has become enthused over the radio collected commands, has worked out a small board provided with miniature markers in the form of tiny planes. By this means, moving the models about, it is much simpler to follow the work and, at the same time, to preserve a record of the flight.

But, any way that you listen in, its great fun and highly instructive at the same time to spiritually accompany the boys on their flights. All in all, it is the next thing to television.

When "radio silence" is called and sets shut off; when ships go aloft without radio, when a radio set goes out of commission, the formation flyers still have an ace in the hole; the visual signal. For a long time every squadron and group had their own signals. There was no standardization. Recently, however, all visual signals were standardized throughout the GHQ Air Force. Here they are:

Visual Signals for Air Corps Maneuvers

SIGNAL	SIGNIFICANCE
Flutter ailerons: Rapid oscillations of ailerons up and down.	**Ready for take-off:** The method of, or formation for, take-off will be ordered verbally prior to the flight, or a normal take-off formation will be used by each unit.
	Attention: This signal will be used in the air or on the ground to attract attention of pilots, to signal them to stand by to receive a radio message, etc.
Fishtail, or yaw: By rudder control, cause the tail of the plane to move alternately right and left.	**Open up formation:** This may also be used to open up and search for some object, formation, etc.; in the air or on the ground.
Series of small dives or zooms.	**Prepare to land:** This signal will direct all pilots of a formation to take necessary steps to prepare for a landing. Other signals may be used to indicate the type of landing; by single airplanes, echelon to one side or the other, in V's, etc., or the type of landing which is normally used by the group or squadron.
Dip right (left) wing.	From any formation other than echelon to go into echelon of flights to that side. Being in an echelon of flights to one side, to go into echelon of individual airplanes on side indicated. Being in an echelon of individual airplanes, if wing is dipped on the side to which the airplanes are echeloned, form echelon of flights to the same side. Being in an echelon of flights or individual airplanes, if wing is dipped on the side away from which the echelon has been formed, form same echelon to the opposite side.
Rock wings: Slow rocking motion of airplane about longitudinal axis.	**Assume normal formation:** From any formation, go into the normal closed up formation for your unit. **Get closer,** when leader rocks his airplane slightly.
Wave microphone back and forth above head.	**Radio out of commission:** When necessary or desirable, this signal may be given by the observer in the rear cockpit.

This Kindergarten is Air-Minded

by HAROLD M. FARKAS

The younger generation is getting its aviation early—in Richmond, that is. This is the story of how it is done. Also introducing you to the bright young lady who's responsible.

There is plenty of interest shown here as Miss Goodman conducts a class in aviation. She uses models and photographs of actual airplanes to illustrate her lectures.

BLOCKS and rubber balls are no longer the latest in kindergarten. There is a group of tots in Richmond, Virginia, that are spending their kindergarten time learning the intracies of aviation—and the idea has proved a bangup success. The far-sighted school teacher behind this novel movement is Miss Rose Barbara Goodman.

As can be seen in the accompanying photographs, the youngsters learn aviation inside out, through the medium of models. They know how to design, cut and place the model plane parts together before they learn the definitions and how to spell them.

Feeling that she may be addressing a possible aeronautical engineer of the future, Miss Goodman stresses in two-syllable words the science of construction and flying—in such a way that her fledglings understand what it is all about. She holds their attention through pictures, drawings and compelling stories. They master the names as best they can, but they know the function of each part better than they know the names.

Before her students even apply a tool to balsa, or glue the fuselage, they must figure out plans and diagrams which Miss Goodman makes intriguing through bits of narrative which fire their eager imaginations. For the simpler models the wings, tails, propellers and fuselages are stenciled on the balsa wood and the youngsters follow the marked lines, cut them out with tiny tools and glue them together.

For the more difficult models, the framework must be built from construction sheets and covered with silk. Miss Goodman shows them how it is done and they follow every step carefully.

Aviation, incidentally, is not the only craft taught by Miss Goodman in her kindergarten. There is boat-building, basket-weaving, clay modeling and metal work, but aviation is by far the most sought-after course Miss Goodman has to offer.

Not only does Miss Goodman's novel kindergarten attract youngsters. There have been older boys working on models there and even a few adults doing special work. Her aviation classes boast enrollments running into the hundreds. Curiously, there are no girls in the classes, although Miss Goodman happens to be a leader of one of the nation's largest Girl Scout troops.

The aviation-inspired Miss Goodman never studied aeronautics in school or in the air. She has flown only a few times. Most of her knowledge was acquired from observing more advanced students working on model aircraft as well as plenty of practice herself in assembling the airplanes herself.

Each boy's finished model is a great source of interest to his classmates. This lad is painting his completed low-wing monoplane.

Here they are, from tots to young men, all absorbed in Miss Goodman's discussion concerning the construction of a fuselage.

The Stearman-Hammond as a Model

by

PAUL W. LINDBERG

POPULAR AVIATION Model Editor.

The finished model of the Stearman-Hammond is a carbon copy of its real counterpart. The tricycle landing gear should make this model's performance a revelation.

MANY requests have poured in for a rubber-powered model that was constructed somewhat different than the ordinary run of models. Our choice, naturally, was the Stearman-Hammond which we believe will give you many enjoyable hours, both in building and flying. This model is so constructed that it may be used both as a display model for mantel pieces or as a flying model.

It was necessary to install two wire clips on top of fuselage to receive a motor stick which carries the rubber bands that propel this model. A 10-inch motor stick is recommended although longer ones may be substituted in order to have longer flights. Plans shown are one half size although templates for ribs, formers, etc., are shown in full size.

Construction of Fuselage

Main longerons of the body are constructed from $\frac{1}{16}$ square balsa. These are placed on the plan with a sheet of wax paper between it to keep framework from adhering to plan when the cement has been applied. After the two sides have been built remove and place in an upright position on top view of plan. The cross members are now cemented into position to form a rectangular shape.

From $\frac{1}{32}$ inch sheet balsa, cut the formers to outline shape and cement in their respective positions. The nose block is now shaped and cemented to front of rectangular fuselage, so that the stringers may be applied. The position of the stringer is clearly shown. Although we advise you to check from front to rear in applying these so that you might secure the proper alignment. Stiff paper is used to form the cockpit.

Construction of Wings

Construct these upon a flat surface in very much the same manner as the fuselage sides. Carefully cut all ribs to the proper shape from $\frac{1}{16}$ inch balsa sheets. Notch these carefully and cement over main spar. The leading and trailing edges are next cut and sanded to shape. Cement these carefully to the ribs. The wing panels may be built with or without the ailerons.

Construction of Tail Booms

These are made from a leading grade of balsa and are sanded oval in shape through their cross sections. It will be necessary to cement in small braces between ribs A and A in order to re-inforce these booms where these booms are connected at wings.

Construction of Elevator and Rudder

These are constructed from $\frac{1}{16}$ inch square and $\frac{1}{16}$ inch sheet balsa with rounded tips. The elevator carries $\frac{1}{4}$ inch by $\frac{1}{8}$ inch leading and trailing edges.

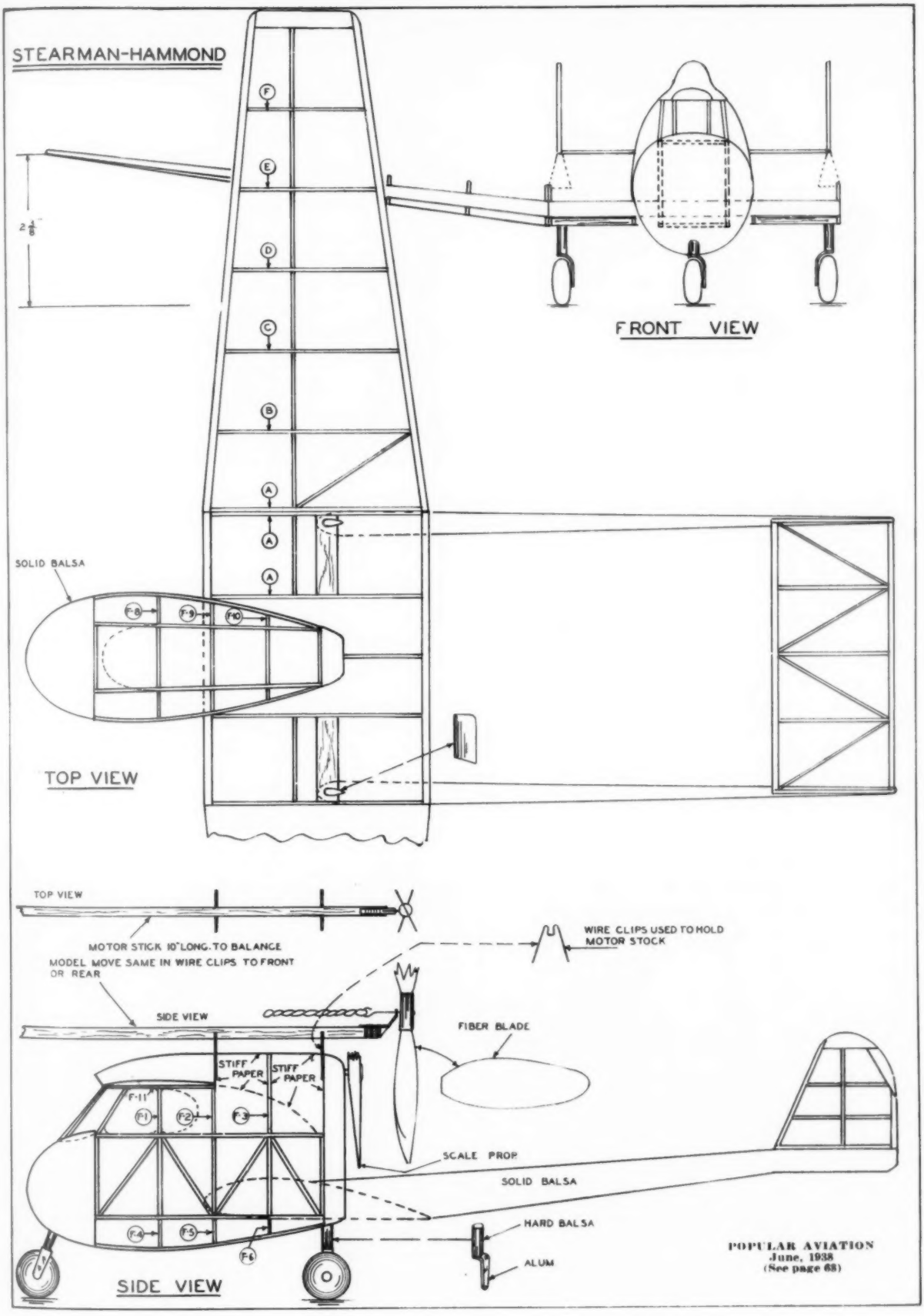
Construction of Landing Gear

Landing gear struts are made from very hard balsa with rounded aluminum curve struts at the bottom to receive wheels. It is important that these be securely cemented and braced to under sides of wing panels so that they will not shear off in case of bad landings.

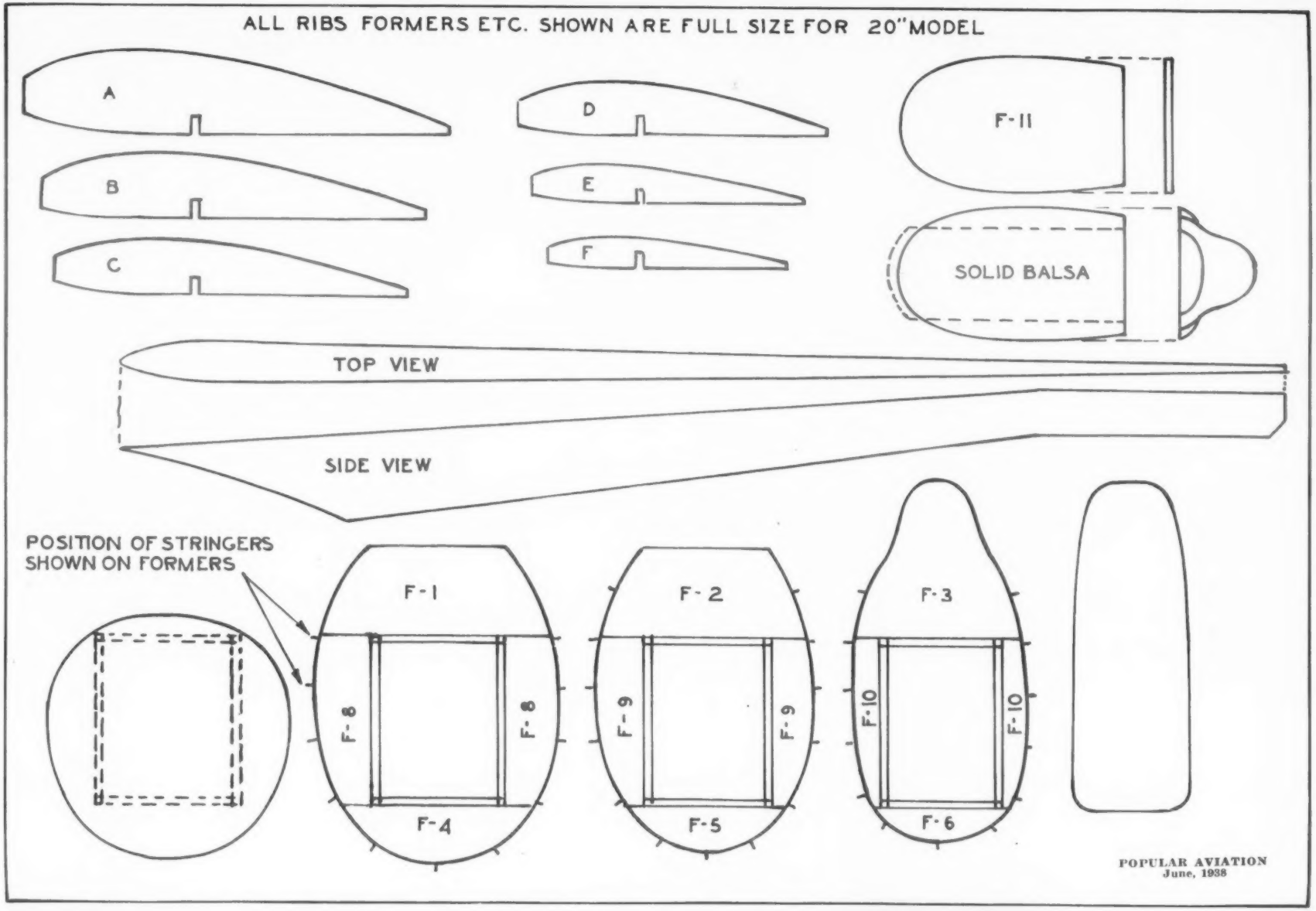
Covering the Model

Do not attempt to cover the body with too large a piece of tissue as this will only cause a poorly covered model. For best results cover in long strips from stringer to stringer. This method requires a little more time but your efforts will be well repaid in the end. The wings are more easily covered. Cover the top sides first and repeat this procedure for the bottom side. After all parts have been covered, apply a light coat of water over the entire surface which will cause the tissue to shrink. A small insect sprayer is an ideal method of applying the water. Pin elevator and wings upon a flat surface so as to prevent any warping. The clear dopes are now applied two to three coats are sufficient. END

This is the model before covering. As it appears here, the model is for demonstration purposes. To fly it, a special stick mounting for the rubber bands fits on top.



POPULAR AVIATION
June, 1938
(See page 68)


ALL RIBS FORMERS ETC. SHOWN ARE FULL SIZE FOR 20" MODEL
A
B
C
D
E
F
F-11
SOLID BALSA
TOP VIEW
SIDE VIEW
POSITION OF STRINGERS SHOWN ON FORMERS
F-1
F-2
F-3
F-4
F-5
F-6
F-8
F-9
F-10
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THE WORLD'S FASTEST SELLING AIRPLANE

Streamlined Exploring

(*Continued from page 33*)

brought to a halt at a point directly across the river from the advance party.

Owing to the heavy growth of lawyer cane, the ground crew explained, they had not been able to cut more than two miles a day. It had taken the airplane but a few minutes to travel the distance the others had been weeks in making!

Although having only 150-foot wing clearance at this point, Archbold felt it feasible to operate out of here in order to save two weeks' walking.

Approximately 25,000 pounds of supplies and equipment were moved in twelve trips. If mule and carrier labor had been used, the job would have entailed weeks of back-breaking labor.

"When the party left the river," the leader related, "we started delivering supplies by parachute. Rice, for example, was packed in 50-pound sacks and these in turn were placed in larger, looser bags and dropped five at a time.

"When the inner sack burst because of the impact of the fall, the rice was retained in the outer ones. Flour, salt, sugar and other supplies of this type had to be sealed in tins because of the dampness. They were also dropped by parachute in 100-pound loads. This proved a very satisfactory method of delivery."

When a subsidiary camp—a "depot camp" to the scientists—was established near Mount Mabion, the plane was again used, all supplies being dropped by parachute at this point, which also was the starting point for trips into the interior.

The wisdom of this plan was shown when a gust of wind turned the amphibian over while anchored in Port Moresby harbor. It was completely wrecked and word was sent by radio to the ground party hundreds of miles in the interior to cease operations. Had it not been for the food supplies in the caché that had been dropped from the sky, the advance crew might have been in desperate straits. As it turned out, however, the ground workers set to work building home-made rafts and took the river route back to Daru.

Strengthened in his belief the airplane could be of immeasureable value to the explorer, the tall, soft-spoken adventurer-scientist went on to higher things: a 13½ ton flying boat that would permit him to carry larger loads and increase his range of exploration.

The plane he is using is basically similar to the patrol boats the Consolidated Aircraft Corporation has been building for the United States Navy. More than 175 flying boats have been ordered by the government and several squadrons in planes of this type have distinguished themselves in a series of long flights across the Pacific Ocean and more recently by a 3,087-mile nonstop trip from San Diego to Coco Solo, Canal Zone.

Last June in the first ship built for him (that was later sold to the Russians), Archbold and a crew of five took off from San Diego on a non-stop flight to New York, successfully negotiating the 2,700 miles in 17 hours and 3½ minutes with enough fuel remaining to carry the plane on to St. Johns, New Foundland, or to Puerto Rico in the West Indies. This was the only flying boat ever to span the United States in a single hop.

To simulate flying conditions in Papua, test take-offs and landings have been made at Lake Tahoe and Lake Mead (Boulder Dam), the altitude at the former being over 6,000 feet—exactly half the altitude of the lakes that are to be used in New Guinea.

Equipped with two 1,000 h.p. engines, the long range cargo plane has a cruising speed of 160 m.p.h. It is an all-metal, semi-cantilever monoplane, the wing being attached by a streamlined superstructure rising from the center of the hull and braced by four streamlined struts to the hull. A readily detachable beaching gear is provided for handling the ship in and out of water and to facilitate movements ashore. The span is 104 feet, overall length 62 feet 6½ inches, and height 18 feet, 5.87 inches. The Navy Department does not yet permit disclosure of weight data and other performance figures of these flying boats.

A component part of the party's equipment is the radio and interior communication system installed in their flying boat. It consists in a main transmitter, auxiliary transmitter, two complete receivers, a direction finder, and an intercommunication system extending throughout the plane and which permits both pilots to use the radio facilities directly when necessary.

Tests made during the flights from San Diego to Lake Mead and Lake Tahoe gave reliable radio telephone communication in excess of 500 miles with the main transmitter, while over distances up to 150 miles the auxiliary transmitter provided equally reliable communication.

The radio direction finding equipment virtually is the same as that adopted by the commercial airlines for direction finding and the elimination of rain static. Power for the radio when the ship is not in flight is supplied by a small auxiliary air-cooled engine set in the wing turret behind the flight engineer's compartment.

On his record breaking transcontinental flight, the naturalist kept in constant touch with his privately constructed 500-watt radio and telegraph station, then located at La Mesa, California. The station signs W2BVB and is licensed for operation in three amateur bands, normally using 3992 kcs., 7206 kcs., and 14206 kcs.

On the exploring plane, one receiver is tuned on W2BVB at all times. Transmissions from the plane are on 3105 kcs., 6210 kcs., and 12420 kcs. Half-hour telephone communications are made until the distance becomes too great, after which telegraphy is used on hourly schedules. The second receiver and both transmitters are used for contacts with Department of Commerce stations, beacon reception and for special schedules. KHAHX is licensed for operation with amateurs.

More than 2,000 photographs are to be taken during the year's stay in New Guinea and the equipment is worthy of mention. One of Archbold's aerial cameras is a Fairchild mounted for oblique photography and can be controlled remotely by the pilot who has a view finder by his window.

The bulk of the pictures, however, will be made with seven Zeiss *Contax* cameras, each member of the party being supplied with one.

"There are no particular problems confronting the cameraman in this territory," Archbold said, "other than the usual ones common to all tropical climates.

"Modern improvements in film emulsions have greatly alleviated the old bugaboos as have the refinements in developing methods. I have found packing the exposed film in tea leaves and sealing in tin cans helps immensely and keeps the film from spoiling. Films have been kept in the tropics as long as four months in this manner, although the results are not as desirable as those developed within 24 hours of exposure. A large film company regularly packs its product in tin or lead containers that have been sealed and this minimizes the extra care necessary for their preservation."

END

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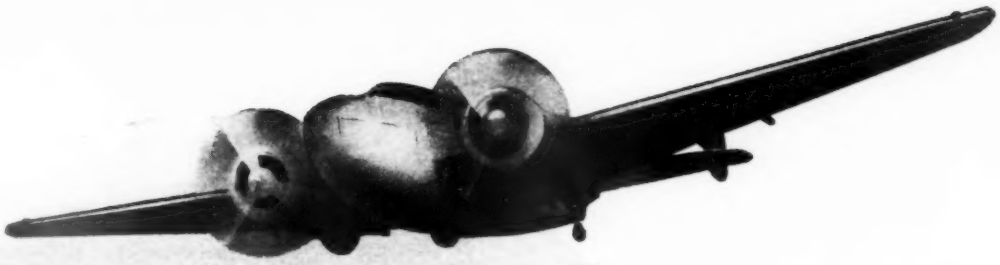

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The experience of this pioneer air line is naturally such that it demands the finest performance from its equipment. K.L.M.'s selection of a fleet of Lockheed 14's is indeed acknowledgement of the unsurpassed performance for which Lockheed airplanes have won international fame.

In all parts of the globe, the Lockheed Electra, Lockheed 12 and Lockheed 14 fill the transportation needs of scores of government agencies, private owners and the flight schedules of 26 world-famous air lines, forming a Lockheed Empire with realms spanning the farthest corners of the earth.

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Dawn Patrol

(*Continued from page 44*)

like a flock of birds on a grainfield. The air travelers were welcomed to Mojave as the climax to a two-day civic celebration. At the breakfast table there was a good deal of banter regarding the right-of-way through the pass and no one got lost because, it was pointed out, there was just one way to go.

It was a high passenger tonnage that traveled to Lost Hills airport for the fourth dawn patrol flight. Eighteen planes left Bakersfield airport, joined by two from Taft and two from Visalia and when they all landed at Lost Hills, it looked like the national air races. The planes picked their own routes to the field, which lay 50 miles northwest of Bakersfield. Airport Superintendent Meadows had as his passengers in the Eaglerock Thomas McManus and Arthur Ferguson, both members of the county airport commission. As he ended the taxi and climbed from his seat, he helped Ferguson out of the passenger cockpit. "Thanks for my hat," he said, dusting it off.

"Let's see that hat," demanded Ferguson, his face registering acute dismay.

"It's mine," reminded Meadows.

"Sure, that's the trouble," answered Ferguson, while McManus doubled with laughter. "I had yours and my hat in my hand and as I pointed something out to Tom, one hat flew out of it. I thought it was yours, so I didn't raise a fuss, but it was mine, darn it. You owe me a hat."

The Lost Hills flight was the last before wet weather set in and all flying was reduced to a minimum for the winter. Each flight was carefully planned. Each plane was carefully checked before each take-off. Each pilot observed the rules of safety that every airman knows to avoid trouble. As the result, there was not a single accident to mar the pleasure of the early morning flights to distant points.

When the good weather comes next summer, the pilots are planning to extend the flights to more remote points in the state. There are possibilities in flights up the San Joaquin valley as far as Sacramento, the state capital, to San Jose and Hamilton field, one of the Army Air Corps fields, west to the coast cities of Santa Barbara, Ventura, Carmel, and south to Los Angeles, March Field and Palm Springs. The southern flights will be limited to the more powerful ships, since there is a thick range of mountains which fringe the lower end of the San Joaquin Valley which offer a formidable barrier to the lightplanes, although these successfully navigated the Tehachapi mountains on the Mojave expedition. Several planes, to be equipped with radio, will practice flying the beacon lanes. The members of the association are anticipating considerable navigation practice on the trips which offer such excellent opportunity for training in cross-country work.

The dawn patrol, beginning as a purely sportsman pilot project, has arrived as a definite asset to the community. It has been a means by which the practicabilities of air travel have been brought home to a great many people whose ideas along the subject were limited to the sight of an airliner passing overhead. It has promoted good will among the communities linked in the airport system of the county and drawn favorable attention to the facilities afforded by these airports. Both transport and student pilots have gained practice in the cross-country flight training afforded and newer pilots have gained confidence in their ability to handle machines over unfamiliar territory and in strange air conditions. Commercial pilots have benefited by the additional passenger revenue and plane rentals at a time when such revenue seemed least likely.

Mass flights like this, then, might be the answer to the "doldrums" private flying now is in in several parts of the country.

The planes which participated in the flights were of all types, with an old Standard, reconditioned and relicensed, making the trips along with the latest model. Light planes predominated, and the Stearman, Stinsons, Eaglerock and *Robin* carried passengers as well.

END

Successful air line operations depend day in and day out on the swift execution of planned, accurate flights. And, as airplanes grow larger and more complicated, accurate flight depends more and more on the trustworthiness of instruments.

It is significant that leading air lines all over the world have equipped their finest transports with Sperry instruments.

SPERRY

SPERRY GYROSCOPE CO., INC.

BROOKLYN, N. Y.

Helium for Sale

(*Continued from page 58*)

shares with all the world, for the first time, the safety and protection of non-inflammable helium in peace-time pursuits.

With an expert from the Department of Mines and another from the Navy Department, Marks weighed the representations of the British envoys, pored over dusty reports from the government files, and within 48 hours had recommended the intensive development of the helium resources by our own government. Also in this short time, the sum of $750,000 was obtained from the War and Navy Departments, and the task of helium recovery was turned over, with Marks' recommendations, to the Bureau of Mines. So momentous was the activity then launched, that at his suggestion, the name helium was never mentioned in all the correspondence and official reports, but all reference was made to "argon," the name of an entirely different gas with different properties.

Although no helium was produced in time for the use of either the United States or Great Britain in the World War, today the government operates the huge helium-producing plant at Amarillo, capable of turning out 24,000,000 cubic feet of helium a year. It is estimated that the Amarillo field has a helium reserve of one billion cubic feet, or enough to last 5,000 years at the present rate of consumption.

It is this huge supply that the Germans, largely, have wanted Uncle Sam to give them access to for several years. The old controversy between the "pro" and "con" schools of thought in German lighter-than-aircraft circles has kept the subject of helium alive incessantly. Many points were made for and against the gas, the most potent one, of course, being that of immunity from fire in midair. However, it was understood that, for some time, certain old-time "zep" men had consistently voiced their disapproval of the gas, largely because of its inability to lift like hydrogen. The safety feature, though, has won out.

Thus, it is to the government of the United States that the world turned after January 1 for helium to be used to prevent another holocaust such as the Hindenburg disaster, thus lending international support to the lighter than air branch of aviation.

Cradled in a war setting, helium first commanded attention for its usefulness to aviation, but other uses which Marks, not being a doctor or a dietitian, did not imagine when helium development hung in the balance, have since been demonstrated. Recent research has shown it is invaluable in the treatment of extreme cases of asthma, and in other medical and surgical uses. Other experiments also point to increasing uses for helium in food preparation, refrigeration and in many commercial operations aside from aviation.

END

Warplane Contracts

(*Continued from page 52*)

spares, for a total sum, with the exercise of the above-mentioned option, of $3,708,002.20.

July 6: To the Curtiss Airplane Division of the Curtiss-Wright Corporation, of Buffalo, N. Y., for 210 monoplace Pursuit planes, together with an adequate complement of spares, at a total cost of $4,113,550.00.

September 9: To the Glenn L. Martin Company, of Baltimore, Md., for spare parts for YB-10, YB-12 and B-10B Bombardment planes, in the total amount of $47,857.56.

September 28: To the North American Aviation, Inc., of an additional order on a previous contract for 34 model BT-9C airplanes and spare parts at a total cost of $411,500.90; same to be used in the training of the Organized Reserves of the Air Corps.

October 4: To the Douglas Aircraft Company, Inc. (Northrop Division) for spare parts for Northrop Attack planes in the amount of $50,853.63.

October 8: To the Boeing Aircraft Company for 13 additional B-17 Bombardment planes and spare parts at a total cost of $2,518,346.83.

October 21: To North American Aviation for 55 additional Model O-47A Observation airplanes and spare parts at a cost of $1,731,407.08, 48 of these airplanes being procured for National Guard organization and 7 for Regular Army units.

October 23: To the Stearman Aircraft Company of Wichita, Kansas, for an additional number of PT-13A Primary Training planes and spares, amounting in all to $122,229.20.

November 9: To the Douglas Aircraft Company a supplemental contract for 29 additional A-17A Attack airplanes at a total cost of $654,155.90.

November 8: To North American Aviation, Inc., for 95 Basic Combat planes and spare parts at a total cost of $1,490,972.96.

December 11: To the Curtiss Division of the Curtiss-Wright Corporation for a service test lot of 13 P-37 Pursuit airplanes, and the necessary spare parts, amounting in all to $531,305.12.

Meanwhile a YG-1B direct-control autogiro has been delivered to the U. S. Army Air Corps, Wright Field, Dayton, O., by the Kellett Autogiro Corp. This ship was the first of an order of seven to be completed for the Air Corps during 1938.

The second of the new autogiros was exhibited by the Air Corps at the International Air Show, in Chicago, and goes to Langley Field, Va., for tests.

The Army Air Corps is giving this machine thorough testing as a possible observation machine. Certain new features have been worked out on the latest model by Air Corps engineers and the Kellett company. Kellett is the only active autogiro manufacturer in the United States today.

END

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IMPORTANT—In ordering helmets, please state whether small, medium or large size is desired.

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D.E.C. GOGGLES . . . Trimmed with a fine quality of fur for extra protection. Wide vision. Non-shatterable lenses.
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OX-5 PISTON ASH TRAYS. Just the thing for your den . . . will hold plenty of ashes and save constant emptying. Better hurry for one of these.
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AERIAL BOMBS . . . Here is your opportunity to obtain an aerial bomb for real atmosphere to your den or clubroom. They won't last long at this special price.
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Brainstorms

(*Continued from page 50*)

was intended to rise by means of a wave motion produced by flexible planes flapped by rollers. The contraption was somehow to be controlled by the curtains seen at the sides. One thing was sure, anyway, the plane was certainly fool proof, no one could get hurt in it because it is doubted if it even moved. Though, at that, one might get seasick watching the planes waving around.

There was another machine which might well have been called "The Flying Bass Drums." It was the *Givaudin*, built and flown in 1909 (which it seems was a banner year for freak aircraft). The fuselage was a triangular girder toting a 40 h.p. Vermorel motor. This motor was a V type, eight cylinder affair, and swung a seven-foot tractor prop by a gear drive.

So far everything was on the up and up, but the wings were very, very radical. They consisted of two sets of concentric drums, the outer drum of each set joined to the inner by eight fins spaced equally apart. The rear drum (the plane was in reality a tandem type for it had no tail surfaces, merely two identical supporting surfaces) was fixed in position, but the front drum could be slewed around to steer the strange craft.

It was claimed for this buggy that banking, and therefore side-slipping was impossible. Also that side winds had no effect, therefore, making cross wind take-offs and landings safe. Evidently the lifting power was found insufficient, for at a later date, three small wings were added to each side of the front drum and one to the rear, which may have improved the performance, but certainly made it look funnier than ever.

Very much on the same lines, was the *Gary*, built in 1910 by William Gary of Paterson, N. J. Instead of the two drums of the *Givaudin* it used but one. But this one had a 40 foot diameter, which, it must be admitted, is quite some circle. Inside the circle were three wings parallel to the ground. It was conventional in having an ordinary trailing empennage on an outrigger. The motor of which nothing can be learned, swung a 12 foot prop. There are no records of flights.

Another design that was intended to eliminate the danger of side winds and for which it was claimed that such gusts actually increased lift, was the Teasdell-Buckell. This was a twin-prop direct lift "canard." It was powered by a 30 h.p. motor and weighed 500 lbs. without the pilot. The length was 18 feet with a span of only 14 feet and it was controlled by two rudders and two elevators. It depended for lift on two rotor-like contraptions in back of the props. These were evidently free wheeling and, according to the old book in which a short description of this craft appeared, were an adaption of the "Thornycroft idea on water propellors." The only Thornycroft in the encyclopedia is a sculptor, and I doubt this is the work of an artist. So your guess is better than mine as to how and why it worked, but it did fly, and at 70 m.p.h.

Oh, they tried everything in those days. They had the courage of their convictions all right, and were willing to risk a little ridicule in their efforts to build a better airplane.

You've all built little paper airplanes with a single surface coming to a point at the nose. Evidently Messrs. Lange and Billard had, too, for they built and flew a full sized one in 1910. This must have been quite a machine. It was 26 feet long and had a 20 foot span. The wing tapered from its trailing edge, three-fourths back from the nose to a point at the front. In addition it had a small stabilizer at the rear of the fuselage and ailerons at the trailing edges of the wings. A 25 h.p motor drove one tractor prop in the nose and one pusher in back of the wing. The running gear consisted of four wheels. The plane was appropriately named the *Fleche*.

Lastly we have the *Tatin-Paulhan*. This rather nifty little monoplane hardly belongs in the foregoing collection of unfortunate freaks. It has been included in this article because it is interesting and because, although apparently sound aerodynamically, it has been discarded in the standardization of type that has taken place in aeronautics.

This beautifully streamlined little bus had a 28 foot length and a span of the same dimension. It had a wooden fuselage fabric covered, and weighed 794 lbs., with a useful lift of 330 lbs. The prop was at th rear of the fuselage and was turned by a flexible coupling. Powered by a 50 h.p. Gnome, fitted behind the pilot's seat and cooled by louvres, it did 81 m.p.h top speed. Although this speed does not seem very high, it was nevertheless the fastest place for its power in the world in 1911. By this success it would certainly seemed to have earned permanency in the aviation world, or at least further experimentation along these lines, but it was discarded as were many other potentially successful designs.

And so they go, earnest attempts to penetrate the mystery of perfect flight. If in this treatise I have seemed to poke fun at and ridicule the efforts of those of aviation's pioneers who were not content to let their inventive genius stagnate, who had the initiative and courage to leave the beaten designing track, and experiment with radical types, I ask to be forgiven. For those early designers we can have nothing but admiration, and for those whose success proved their ideas correct, and those less fortunate as well, nothing but praise.

END

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The Birdmen's Perch

FLASH! At last, a Birdmen's Perch Whopper Club! New membership restricted to yarn spinners whose whoppers on GULF AVIATION GASOLINE are judged most outlandish, and are printed on this page. Certificates of membership (see below), autographed and individually printed with illustration of the member's own particular whopper. Send your goofiest to:

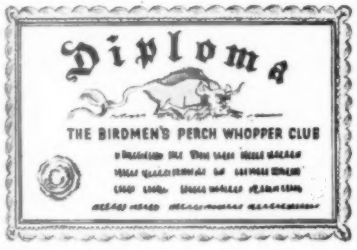
MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Dept., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

HOW ABOUT MOOSE?

Dear T.W.T.—In reference to cows always huddling with tails to the windward . . . You might tell L.C. that barnstormers in the Texas Panhandle already know how to use cows for windsocks. Does he know that Bison are just the opposite from cows? That they invariably head *into* the wind?

—G. Christopher, T.W.A.

WHOPPER CLUB



Of special interest to those who may be even a little more "teched-in-the-haid" than the average reader of this page, we announce the charter member of the Birdmen's Perch Whopper Club—Captain J. C. Adams of Fort Lincoln, N. D.

We have mailed the Captain his duly endorsed Certificate of Membership, emblazoned with bull rampant—the illustration of his whopper published last month. He may hang it wherever he wishes, or he can just toss it in that old trunk upstairs. We don't care. But we warn him, these certificates are rare.

Member No. 2 is Lawrence Farnham of the Flying Service at Longmont. His certificate, illustrated with Col. O. U. Dope on the flying gas tank, will be mailed.

As explained above, one of these handsome documents will be awarded every month. Who's the next member?

BUGHOUSE TRAVEL

Try this problem. It's simple, and yet nine out of ten people, math sharks included, give the wrong answer!

There is a two-way, 17 hour, non-stop service between New York and San Francisco, planes leaving every hour, on the hour. Now, including the plane that is landing as we take off from New York, and the plane that is taking off as we arrive in San Francisco, how many planes do we pass en route?

(Mail your answer to T.W.T. He'll tell you whether you're one of the puzzle-wise 10%.)

"He was headed toward Australia at a terrific rate."

MAJOR OPERATION

Honest, a slick surgeon couldn't whisk out an ailing pair of tonsils any neater than Gulf's famous Alchlor Process yanks out the "sick" fractions of airplane oil.

For the Alchlor Process takes already refined, 100% Pennsylvania oil and further removes, literally, as much as 20% *more* motor-gumming sludge and waste.

That's why Gulfpride Oil, Alchlor treated, is the "world's finest" oil for planes.

THIS MONTH'S WHOPPER

Dear Mr. T.W.T.—I would swear to this, except that the notary's office is closed, and anyway it would cost me two bits.

It all started when Colonel O. U. Dope and I decided to develop a fully retractible airplane and prove that, although retractible landing gear is fine, there is a lot more drag caused by the wings, tail etc., and that they should also be retracted.

We met with some difficulty trying to decide whether to retract the wings into the fuselage, or the fuselage into the wings, as both were to be retracted. However, this was worked out along with other details, such as locating a place to retract the motor and prop when the rest of the plane was in its retracted position.

Came the final test when the entire plane was to be retracted! After filling the tank under the seat with five gallons of *Gulf Aviation Gasoline* the Colonel took off to make history. At a thousand feet he began retracting the new ship . . . wings . . . motor . . . tail . . . and finally the fuselage! Then there was a flash of light, a cloud of smoke! Well . . . folks, the last I saw of Colonel Dope, he was sitting astride that five-gallon tank of *Gulf Aviation Gas* headed toward Australia at a terrific rate.

—Lawrence Farnham, Longmont, Colorado

P.S.—The Colonel writes that upon arriving in Australia he had to drain out the remaining four gallons of gas and smack that tank over the head with a boomerang, to prevent it returning home without him.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

An Airy Chat With the Editor

(*Continued from page 9*)

operation, including radio in all of its manifestations, it hardly seems that the time has arrived for the jump to the 100 passenger plane. It is one thing to work out a structure for a 20 or 30 passenger plane and still another to work out the design and materials for a 100-passenger plane. The 100-passenger job is obviously more than simply an enlarged copy of its smaller sister.

But, forgetting the physical side of the problem for the moment, we must look forward into the psychological effect on the public, that a possible accident to a 100-passenger ship would have. The public is not yet sufficiently accustomed to 10-passenger ship crashes to philosophically accept a crack-up of a 100-passenger ship.

I believe that a 100-passenger ship is too far in advance of its time for commercial reasons, disregarding the perfection of the mechanical structure. The loss of 100 passengers at one time would deal a serious blow to the future of commercial aviation.

* * *

ONCE more, election time approaches. Politics blasts out from every loud-speaker and, in due time, will progress to the tail-boards of motor trucks and the stages of the local movies. That time is here again when the householder will be confronted with the old, old problem of which group of candidates to intrust his future tax paying career.

And, if aviation is wise, its members will begin their campaign with the foremost of the political promoters. It is an ideal time for the pilot and plane builder to present his problems to one of the political parties and make a real issue of the matter. If we can only get a pledge out of one of the candidates in each state, to support the cause of the pilot, it will be at least a start toward freedom and home rule for aviation.

* * *

C. G. GREY world renowned British aviation editor and stormy petrel of aviation international, has broken his long silence and has finally taken a slap at old P. A. that has been anticipated.

And so, the fiery editor of THE AEROPLANE, in a burst of patriotic fervor, has taken a nice big rock and sailed it right through our parlor window. A recent article in P. A. proclaiming the superiority of U. S. over British planes griped him mightily but—unusual for him—made a sorry job of it by going much too far in his condemnations. In all truth we can't blame C. G. personally for the few paragraphs; rather we are inclined to blame the outburst on a bad meal or dyspeptic tendencies.

But, like Mr. Grey, we now also rise to patriotic heights and resent the crack he made at the people of the United States in general when he said: "Americans are funniest when they are unconsciously funny." This statement rather contradicts the text of his article for he obviously believes that our statement was anything but funny.

As a matter of fact, we have a hunch that he knows our statement is true and that is what makes him so sore. Own up, C. G., and acknowledge that planes built in the United States are better than those built in Great Britain!

WELL, a plane may meet with less resistance in the stratosphere and therefore fly faster with a given horsepower than in the lower troposphere, but this is not the greatest merit of high-level flight. There could be no soup nor mountain slapping in the stratosphere.

* * *

MAYBE some more old historical ideas will stage a comeback, possibly, labeled with a new name. 'Way back, so far that we have forgotten the date, a Chicago fellow named Thorpe conducted some experiments with an X-ray spark plug that seemed promising but which never arrived. The plug was in the form of a quartz tube inserted into the combustion chamber, and the gas-air mixture was ionized and fired by a discharge of cathode rays. The ionization was so extended that ignition was practically simultaneous throughout the combustion chamber and, when the device could be induced to work (electrical bugs), there was a marked improvement in the engine output.

It just occurs to me that, in the nature of things, that this old idea could be dragged out of its stall and put into service on high compression engines. It may be that the bug that stuck Thorpe has since been cleaned away by other investigators.

* * *

WHY clamor for the uncertainties of Diesel engine propulsion when there are so many other available types of heat engines? For example, with the single exception of the mercury turbine developed by the General Electric Company, there has been no example of a binary heat engine in all of American history. And this is something to work upon that is worthwhile.

If the public believes that safety lies in Diesel fuel oil, why not remind the public that a binary engine can handle fuel quite satisfactorily that is not many steps removed from asbestos. The binary engine is not dependent upon questionable compression nor upon watchlike fuel pumps and atomizers.

* * *

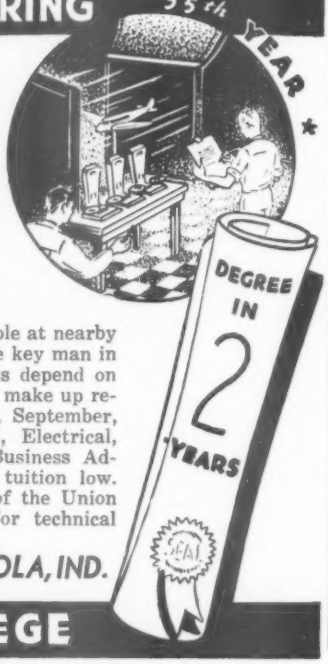
DIESEL fuel oil is by no means cheap for it must be absolutely clean, moisture free and free from light volatile matter. It is taken from fractions well up in the cracking zone, hence it would quickly become as expensive as gasoline if there were any great demand for it. Don't think, for one minute, that a Diesel will burn refuse oils, tars or anything like that.

* * *

BUT—whatever the motive power will be in the future, we may feel assured of the fact that eventually conditions will be such that the heat engine must be completely reorganized in respect to the manner of burning the fuel and this favors, of course, the external combustion engine. So long for now—

J. B. R.

AERONAUTICAL ENGINEERING



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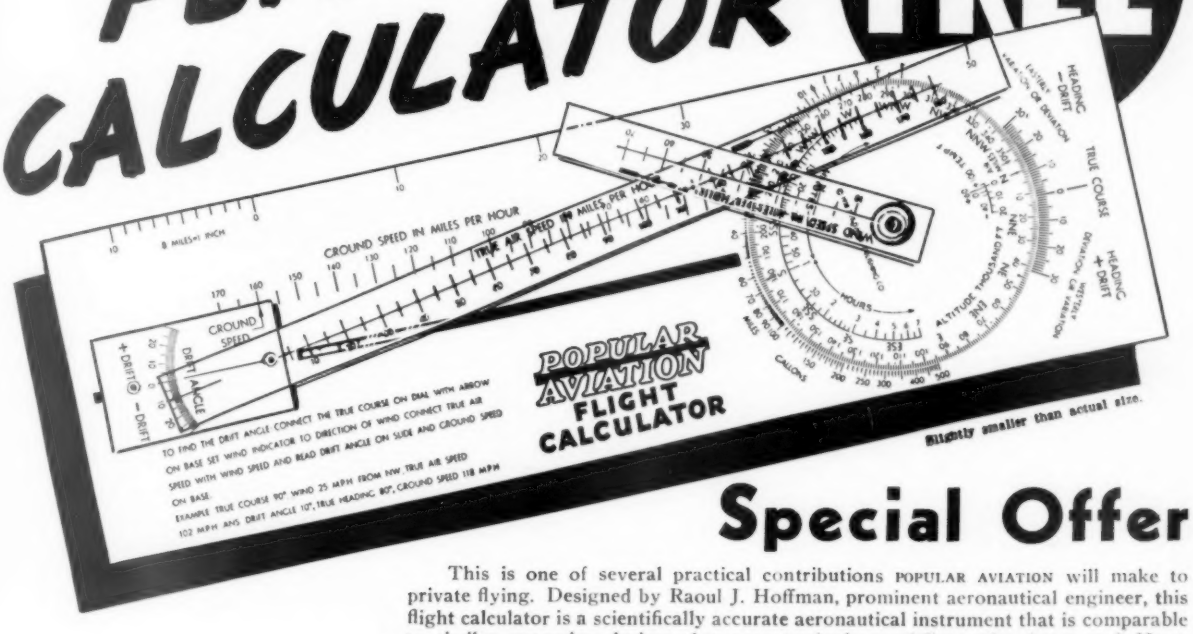

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Ed Sines

(*Continued from page 40*)

printing press, but Sines, with little taste for things mechanical, was able to contribute only encouragement. Wooden parts were turned out on a homemade lathe; from a junk shop a metal roller, to be weighted with gravel filler, was obtained; a stone slab served as flatbed. Wilbur suggested improvements.

"Those boys were born inventors," Sines asserts. "If they hadn't developed the flying machine they just naturally would have invented other things. Why, there was that 10-key adding machine. After I left the Wrights I learned bookkeeping. One day I told Orville about a new adding machine the office had bought. I told him there were nine rows of keys on it, nine keys to the row.

"'Too many keys,' he said.

"He told me he could make one with just 10 keys, and I laughed at him. Sure enough, some time later he showed me a model of it, made with sticks tied together instead of metal rods. And it worked, too. That was before there was a 10-key machine on the market. I'm convinced Orv would have made a lot of money out of his invention if he had gone ahead with it."

Orville was 17 when he, Wilbur and Sines agreed to publish a weekly newspaper. They needed a bigger press, so they built one. The result was a miracle of effective crudity. The huge roller raced back and forth, by the grace of myriad gears and levers, over a flatbed that originally was a marble tombstone.

Off the new press came the *West Side News*, in March, 1889. The plant was not far from the Wright and Sines home. Wilbur was editor, Orville was business manager and Sines did most of the advertising soliciting. The paper made money, but when expanded a year later into a daily, *The Item*, lost money so fast that it "folded" within three months.

Thereupon the trio turned to job printing, with considerable success. Both Orville and Sines qualified as good printers, but Wilbur was slower. Some of the jobs were pamphlets of as much as 100 pages. The firm also printed a Negro journal edited by a schoolmate of Orville and Sines, Paul Laurence Dunbar. The latter, whose regular work was running an elevator, scribbled on the print-shop wall one day an appreciative verse:

"Orville Wright is out of sight in the printing business;
"No other mind is half so bright as his'n is."

After two years of job printing the Wrights took advantage of the vogue for cycling by opening a bicycle repair shop. Some of the West Side boys, including Sines, had made a lucky purchase, acquiring bicycles from a firm that went out of business, and getting bargains. They formed a bicycle club. Orville and Wilbur made a tandem bicycle of substantial gas-pipe construction in which they rode about the neighborhood.

About the time when the Wrights became interested in the bicycle venture, but before they began putting their own machines together for sale under the trade names of "St. Clair" and "Van Cleve," Sines, now 22, was forced to quite for more lucrative employment. Lacking mechanical interest, there was no place for him in the bicycle shop, and the printing business suffered from neglect. Sines became a bookkeeper. The Wrights and he remained neighbors until 1906, when Sines married. By that time the former partner knew that his playmates really "had something," for already they were making dozens of flights at Simms Station, east of Dayton.

Always known to the Wrights by the nickname of "Jameez," Sines bears on his forehead the scar of a gash he received as a boy, when he used to steal short rides in Bishop Wright's rig. Lorin hitched up the horse every morning behind the house, trotting through the alley to the curb. Orville and Sines would hop in for that short ride. One morning the latter stood up, waving his arms. The horse stopped suddenly. Sines didn't, and landed on his head on the cobblestones.

"I knew he wasn't killed," said the man who lived across the street, to Mrs. Sines, "because of the way he hollered."

Wright's old friend, now in the insurance business, recalls that time when he went to Simms Station to see Orville fly.

"He invited me for a ride," he says, "but I'd promised Mrs. Sines I wouldn't go up. When I told Orville, he flew so low that I threw myself flat for fear I would be hit, but I guess he didn't come within 25 feet of me."

An indication of the esteem in which the Wrights held the boyhood chum they left behind in their rise to fame is found in a letter written by Wilbur, then in France, to Orville, who was recovering in a Dayton hospital, late in 1908, from injuries received in a crash at Fort Myer, in which Lieut. Thomas Selfridge was killed.

Wilbur suggested various Christmas gifts to be sent, a sizeable cash one to Sines. The brothers each put up half of the amount.

His employer happened to be secretary of the Dayton Bicycle club, which sponsored the homecoming fiesta. A death in the family prevented the secretary from taking part, and he deputized Sines to handle the job of caring for the business end of the observance. In appropriate ceremonies at the county fairgrounds, following a two-mile parade, the Wrights were presented with medals by the city, the state and the nation.

To ride in the Wright carriage, as personal escorts, were named Sines and another friend, Ed Ellis. The former recalls that the shades were drawn, but the windows were opened about four inches, and as scores of admirers rushed up to shake hands with the Wrights, the inventors shrank back. Sines and Ellis obligingly shook the hands, much to the merriment of the Wrights.

At present Sines is confined to his home, convalescing from an attack of shingles and influenza. Orville Wright called on him recently. Occasionally Wright visits the Stevens printery, and tries his hand at his boyhood trade.

Shy as always, Wright shuns autograph hunters and would-be biographers. Only in the presence of such friends as Sines does he relax to recall the experiences of a generation ago, when two boys on Dayton's west side made excellent community laughing-stock with their fool notion that they might fly.

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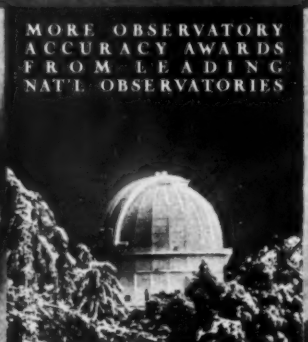

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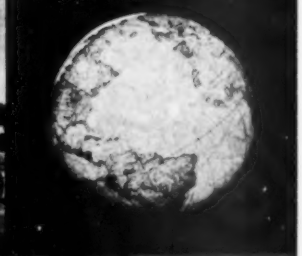

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The Flying Dunnes

(*Continued from page* 10)

pected. Dunne and Kelly plan to fly the ship cross-country for tests and in order to demonstrate it to sales prospects. The trip is scheduled for the spring.

"The period in aviation has arrived," Jimmy said, "when flying is coming out of its infantile stage. More and more people every day are interested in flying. And for that reason, a small ship, as foolproof as science can make it, economically operated and priced to fit every pocketbook, is bound to be a gold-mine to its developers. So what? So I'm declaring myself in. Aside from that I'm crazy about flying, anyway."

Jimmy always used his plane for his vacation trips. When not working in a picture, which isn't often, he spends the greater part of his time either in the air or tinkering with his ship. He has flown to New York and has also taken a party three times to Indianapolis, Indiana, to see the auto races in that city. On the eastern trips he carried a co-pilot to help him in his study of hazards and obstacles encountered in cross-country aviation.

His interest in flying began during the filming of a picture which he and Shirley Temple made together. That movie, based upon an aviation story, was the incentive which caused him to enroll with Bob Blair, prominent flying instructor. Since his first lesson, he has been a dyed-in-the-wool enthusiast.

An interesting outgrowth of that picture is Jimmy's friendship with Shirley Temple. Not only did the famous pair form a liking for one another, but Jimmy feels that Shirley was indirectly the cause of his learning to fly. So, for the past three Christmases, he has presented her with a Yuletide gift—from the air. He flies over her Santa Monica home with an unbreakable gift, and drops it on an extra large sheet which she spreads out on the grounds of the spacious estate. It has gotten to be so much a part of his Christmas to Jimmy that busy as he was with preparations for his wedding this last Christmas, he didn't forget his part of an aerial Santa Claus for his little pal. That is typical of the reason that he is known as a regular guy by everyone who is associated with him.

Many times Dunne has used his own plane for sequences in pictures. Last year, during the filming of *Venus Makes Trouble* for Columbia there was a sequence in which not only his plane was used, but he was piloting the ship himself. The scene was made as a long shot, and was filmed from the ground so that his face was not clearly visible. Most people who saw the picture thought that a hired pilot was flying the ship.

There is one question that nine out of ten people who have aeronautical conversation with Jimmy ask him. I was no exception. While the four of us waited for Aldo to load his camera—Jimmy was taking us for a ride—I queried him about the famous flight he made in which he flew a murderer from Los Angeles to New Orleans, Louisiana.

He turned from the controls at the question. "I'd never do it again," he said, soberly, one hand on his wife's shoulder, unless it was a matter of life and death. I've been scared before, but on that trip . . . boy! . . . I was petrified. That was *some* ride, what I mean. And I was scareder-er when I got to thinking about it than I was during the actual flight.

"Previous to that trip I had been in New Orleans on location for the picture, *Mysterious Crossing*. That was in October, 1936. While I was there I made the acquaintance of John J. Grosch, Chief of Detectives of the New Orleans police department. A month later Grosch came to Los Angeles to return a fugitive murder suspect to New Orleans. He encountered extradition difficulties here, until the prisoner finally waived extradition formalities provided he was returned to New Orleans by a certain date. It was possible to make that date in one way only: by flying. Grosch told me about it, and as I wasn't working, I volunteered to fly them back to the southern city.

"Two days before Thanksgiving, Grosch, the prisoner, a co-pilot, and I, took off. We were grounded for an entire day at El Paso because of severe sand storms, and did not arrive in Dallas until late Thanksgiving day. We spent the night in Dallas and landed in New Orleans at noon the following day."

For his services Dunne was made a New Orleans detective, his first honor to be received directly from aviation. Several weeks afterward he was made a member of the Aero Division of the Los Angeles Police Department, in which organization he is a member in good standing. He has that group's insignia stamped upon the side of his ship. The following incident will suffice to show his pride in it.

Aldo asked him to pose before the insignia for a picture. As Jimmy took his position he said, "There should be a numeral 37 in that blank space, showing my membership last year."

"Let's make a 37 with this black grease pencil," Aldo suggested. "Then it would show up in the picture."

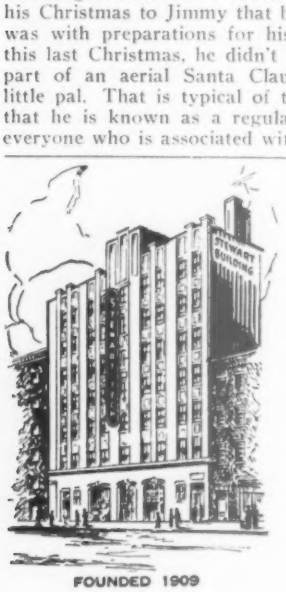
"No, sir," was the reply, in no uncertain tones. "You might scratch it and that's something I am proudest of."

Getting back to the New Orleans trip, Jimmy continued, "It isn't necessary to mention that all our lives were in constant danger during the entire distance. The prisoner, the last member of a gang suspected of a brutal cafe murder and hold-up, fully expected that he was being returned to the gallows. I felt like any moment he'd leap at the controls and send us into a fatal spin. What made me so jittery was the fact that I not only had my own life to think about, but the lives of the other passengers as well."

"Have you had any occasion to use your ship in police work since that experience?" I asked.

"Sure," he shouted through the noise of the exhaust as he warmed up the motor. Then, as the motor idled and he awaited a "go ahead" from the tower, he continued, "last spring when the sexfiend murdered the three little girls in Inglewood I helped search for their bodies. Lieutenant Jack Caris, Commandant of the Aerial Division of the Los Angeles Police Department, acted as co-pilot. We've worked together several times since then."

(*Concluded on page* 82)



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P.A. June, 1938

The Flying Dunnes

(*Continued from page 80*)

I'll confess that I was just a little jittery as we taxied up the runway. After all, I had never been piloted by a movie star before—and anything can happen in Hollywood. But it was an elegant ride. And a good long one. We made a wide sweep out over the hills, back out over the ocean at an altitude of 6,000 feet, and then back toward the field again.

"Have you ever seen the new race track they're building?" our pilot asked. Neither of us had, so he flew in that direction, obligingly tilting the wings and jockeying the ship so that Aldo could try some aerial shots with a miniature camera.

There was only one moment during the ride when I was the least perturbed. Frances had her arm across the back of Jimmy's seat—she was sitting in the front with him. Obviously he decided that it wouldn't be wise to allow her to go unkissed any longer, so he turned loose the controls, put his arms about her, and kissed her. It was a beautiful gesture, and, after all, we didn't drop over three or four hundred feet.

Incidentally, Jimmy and Frances left shortly afterwards for one of Hollywood's first aerial honeymoons. That is, when the groom was sole pilot. Their first stop was San Francisco. From there they intended to spend the next two weeks flying wherever their fancies, and the vagaries of wind and weather, dictated. His wife's first time aloft, incidentally, was with Jimmy as pilot.

"What was the most thrilling, dangerous, exciting, or what-have-you experience that you ever had?" I asked, as the grease monkies were rolling the ship back in Hangar 4 once again.

He thought for a moment. "I guess I'll have to answer that question in two parts. There were two incidents which stand out in my flying experience more than any others.

"One of them occurred when I was on my way East and had to make a forced landing in a plowed field in the Ozark mountains near Joplin, Missouri. The motor went out on me. Scared me to death. Anyone who ever had to make a forced landing in mountainous territory will know what I mean. To make a long story short we landed without hurting a thing—us or the plane. The hardest part was getting the plane towed out to a place where we could take off again."

"And what's the second?"

He grinned the grin that has made him famous. "That one happened right here on this field. I was making a test for my license. One of the tests is a loop. I started swell, but I pulled out too soon, and came darned near falling out of the ship. Lost the centrifugal force necessary to hold me in the seat, particularly since I had forgotten to fasten my safety-belt. For a few minutes there I rattled around like a pea in a pod. I sure thought I was a goner. Say look, youse guys! I'm about talked out, and Frances is waiting. Please, can I go now?"

"How's about me making one real quick shot of you and your ship inside the hangar?" Aldo said. "It won't take but a second."

"Uh UH!" Jimmy shouted. "Don't you know that's the unluckiest thing in the world a flyer can do? *Of course* I'm not superstitious, but money couldn't pay me to have my picture made inside that hangar. I told you I was lucky, and believe me, I intend to remain that way."

And Jimmy has—very much so. He's generally considered to be one of Hollywood's most conservative, safest airmen. What's more, we wouldn't be a bit surprised to see Jimmy give something to think about in a business way. That is, of course, if the James Dunne who's busy before the camera ever decides to set up shop as James Dunne Air Services, Inc.

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Ships That Failed

(*Continued from page 27*)

whole airplane being rebuilt and raising the wing up a number of inches so that it would not interfere with landings. The airplane was rebuilt and designated XFJ-2. This airplane became very well-known and considerable information concerning her performance was made public. When the navy tested her again, however, they found that the landing speed was still far too high for carrier work, so the airplane was again rejected. The B/J concern went to work again, and produced the next in the series known as the XF2J-1. This was a two-seater fighter which embodied the principles of the XFJ-1. After being tested, the XF2J-1 was found to be too heavy and therefore too slow, and it fell down in competition against other types submitted. The B/J people decided to try again, and their last effort was the XF3J-1. This was a decidedly different type than they had built before and it was a rather radical departure from their former style. They ran into trouble with the engine mount, and after a number of attempts to straighten this difficulty out, the XF3J-1 was finally rejected.

Northrop is a comparatively newcomer in the field of Navy Aviation, but up to now that company also has had its share of misfortune. The first airplane they built for the navy was widely publicized. It was a short stubby single-seater fighter known as the XFT-1. The first difficulty encountered with this ship was with the propeller. They tried using a number of different props until they got the best results. Then trouble developed with the tanks. Due to the vibration of the airplane when landing, the tanks did not hold properly. This had to be remedied. The XFT-1 landed very "hot" and took a very long roll after landing. The engineers tried all sorts of tricks on this ship, then sent it back to the factory for a modification. When she came out of the factory the second time, she had been redesignated XFT-2. She still landed too fast, and was rejected. Northrop went to work on another airplane for the service and while running factory tests, sent it out over the ocean to practice stunting. The pilot and the airplane disappeared and no trace of either has been found to this day. This again was a rather severe setback to the Northrop organization, but they went to work again and produced a new type known as the Northrop XBT-1. This is a naval adaptation of the Army A-17A type and is a speedy and efficient-looking airplane. As this was being written it was still undergoing the navy tests and no further information is available.

Vought, Sikorsky, Consolidated, Lockheed and other manufacturers of aircraft have had their fill of discouragement and heartbreak with new and untried airplanes. It is through all these handicaps and disappointments, that new and better airplanes emerge. You have only to visit any Naval Air Base and see the latest types, to see how much progress has been made. New aircraft designs and equipment are constantly being tried and only the best of materials and workmanship is used in order to achieve the finest results possible. An airplane is designed on paper with everything minutely computed and checked, but no one can tell how a new airplane actually will behave until it has been test flown. Many airplanes which appeared to be the last word on the drawing boards, developed bugs when test flown.

There is no dishonor attached to the airplanes that failed in these tests. In the process of experimentation, some naturally have to fall by the wayside. Those that have fallen, however, have done their share as the stepping stones in the building up of our efficient naval air force. END

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Propellers Without Formulae

(*Continued from page 64*)

Clark Y section by the maximum thicknesses the airfoil section at each station will be obtained and the propeller may be laid out.

The chart may be used for designing propellers for gas model engines.

This simplicity of designing propellers with accompanying chart was the outcome of reports on propellers tested in wind tunnel. The data on efficiencies were obtained by compensating for the slipstream effect on the interfering body. The diagram shown in Section 13 indicates that there could be more than one efficiency curve plotted from the same propeller test. Line B gives the propeller efficiencies in free air, line A tested with a body, line D with the total body resistance subtracted, and line C corrected for the slipstream effect. Very often the line D passes the 120 per cent mark, for the additional drag created by the slipstream adds a reactive thrust to the propeller that should be subtracted.

The efficiency of a wood propeller is usually a little lower than the one for a metal propeller. Lately, however, metal leading and trailing edges reduced this difference for propellers designed for low speeds.

The lack of wind tunnel tests caused peculiar propeller designs during the formative years of aviation, designs that do not conform to the present day conception of an efficient propeller. Some of them are pictured in Sections 10 and 11. Very odd was the Parseval propeller used on airships with its canvas blades held in position by the centrifugal force of the lead weights. The Wright brothers started the general use of wood for propellers. Another interesting design was the Garuda propeller, with its laminations lying in the resultant of the centrifugal force and the thrust forces.

But very peculiar was the invention of the propeller.

One hundred thirty years ago a conveyor spiral (Section 12) was tried for ship propulsion instead a regular side-wheeler; the result was poor. Returning to the harbor the spiral hit a reef; a large piece broke off the blade and instantly the ship gained speed; from this the designer (who was a professor) guessed right, and thus was the propeller invented by accident.

Propeller sections follow the same changes in design as the wing sections do. Cambered sections have now flat lower surfaces; they again will change to streamlined sections. Low-powered propellers should use the Clark Y section, shown in Section 16, for it is the easiest to carve and the best for medium tip speed.

The kind of wood used for propellers depends on the maximum tip speed, which is a factor found by multiplying the diameter in inches by the revolutions per minute. Up to 170,000 spruce can be used, up to 210,000 walnut or oak, and up to 240,000 birch or hickory. Above that metal propellers should be operated. The dimensions for the hub is usually taken from the steel hub supplied with the engine.

In spite of the high efficiency (93 per cent) obtained with two-blade propellers various attempts were made to replace them with some other means of propulsion. Usually they try to combine the lifting and propelling forces in order to eliminate the fixed wings. Two are illustrated in Section 12; the first uses the side-wheeler design, the second employs the double acting streamline section, that has a high lift-drag ratio.

The efficiency of a propeller is often reduced by the interference of airplane parts lying in the path of the inflow or the slipstream. The wing and the body are the main interfering agencies as shown in Section 14 and Section 15. Tractor and pusher propellers will have the same efficiency if placed at a certain position relative to the wing or body. Section 18 shows the interference the post-war radiators had on the slipstream, which made a great part of the propeller ineffective. Lately, however, the added gearbox streamlined the entering part of the high-powered engines and the designer added blade area close to the hub, redesigned the cowling, which previously was found to be correct. The result was a few per cent increase in efficiency.

Very discouraging is the fact that with increasing tip speed the efficiency of the propeller drops very fast. Section 17 shows a diagram of efficiencies at high tip speed, speeds that are close to the velocity of sound; 1,100 feet per second.

It seems that a radically new propeller section must be designed or other means of propulsion (rocket) devised in order to fly faster than 500 m.p.h. at sea level.

END

This Japanese two-place warplane carries a propeller especially designed for it. The special wooden propeller had to be engineered to overcome the resistance set up by the large liquid-cooled engine and the heavily-braced biplane wings. This particular ship is a Kawasaki reconnaisance type now being used in China.

I Tried Soaring

(*Continued from page 36*)

only $1.50 per hour each! And this included all their expenses.

It took me only ten minutes of pencil and paper work and a half hour's soaring flight to convince me that these boys were smarter than I was about inexpensive flying for sport!

Since this startling discovery I have sold my interest in the airplane and have joined their ranks. On each flight now I am finding a new and ever increasing joy in soaring. I've learned more meteorology and tricks about "silent flight" in one month than I ever learned with power flight in a year. I still fly airplanes, but only when I really have an important trip to make quickly and for business.

But when it comes to just flying for sport, I'll take the Scotchman's airplane!

END

The Mail Flies On

(*Continued from page 16*)

school students are in progress and schools everywhere are planning airmail talks by pupils, displays of stamp collections and model airplanes and similar observances. Civil and fraternal bodies and organizations of business and professional men and women throughout the country also are cooperating with the Post Office Department in furthering the drive.

"It is expected that as a result of this campaign every American will be impressed with the airmail service and the progress which has been made in aviation since the airmail service was established," said Mr. Branch, under whom the present airmail system functions. "It is also expected that every citizen will be acquainted with the advantages which the airmail service affords."

END

Wings Over the Mediterranean

(*Continued from page 30*)

growing air forces, the air bases in the Mediterranean are being built up feverishly.

Italy is the pace-setter and much depends upon her. Hers is the ideal spot as far as strategy is concerned; hers is the initiative. And she names the battleground. Italy won't fight in the Atlantic; England will have to fight in the Mediterranean.

As far as Italy is concerned, she has today the fourth largest military air force in the world—about 2,300 first-line planes, with enough more to give her an air fleet of about 3,300 available for emergency, able to fight no matter what happens to Italy's sea fleet.

As long as the Alps stay where they are and her alliance with Germany sticks, Italy need not worry overmuch about defending her north. This leaves practically all of her air force for use in the Mediterranean region, an advantage the other powers do not have. Accordingly, she claims the sea is her oyster, the more so because her planes are land-based. She has only one old aircraft carrier and is not interested in building more.

Italy is one nation which does not quibble about the value of warplanes. France believes in her army as her first line of defense—her strategy is for the other nation to strike first—and her air force is an auxiliary of the army. England is still undecided whether her planes shall be independent or support the other services—likely enough, the biggest assignment for British planes will be to protect London from dreaded air raids. But Italy believes wholeheartedly in the war philosophy of the late General Douhet, an exponent of the *attaque brusque*—the quick hammer blow. If war came, she would rely upon winning it quickly with aviation. So she is strengthening the power of her bombers and increasing their range.

She is now rushing through completion of super-bombers which are planned to carry bomb loads of 3,300 pounds over a radius of 1,250 miles at a speed of 210 m.p.h. at a height of 8,000 meters (26,240 ft.). She is building others which she hopes will speed at 250 m.p.h. at a sub-stratosphere height of 10,000 meters (32,800 ft.).

Her armament program calls for 4,100 first-line planes by 1941. And 60 airports, most of them for war purposes, are being built. Among these are two huge airdromes along the Adriatic coast, one to accommodate 300 planes and 1,000 aviators, the other to house 250 planes and 750 aviators. Already she has 150 modern airdromes scattered through her empire. She now has 3,000 pilots on active duty and wants another 1,200, as well as a total officer personnel, including ground forces, of 7,670 and an increase of her non-commissioned officers to 12,500.

Italy's warplanes are contained in four general forces, of which the independent "air fleet" is by far the largest, containing—according to General Giuseppe Valle, Under-Secretary for Air—93 groups organized in a variable number of squadrons. There are also the Army Aviation Service, an auxiliary containing five flights of 15 groups of observation squadrons; the Navy Aviation Service, another auxiliary made up of variable numbers of observation squadrons in four commands, and the Aviation for Colonial Defense.

Mussolini is not claiming he can handle all of the Mediterranean with warplanes from Italy's mainland. To understand Mediterranean air strategy, it is necessary to recall that there is a limit to the distance a plane can fly out and return to its origin—especially if it is a heavily laden bomber. Air enthusiasts often go hog-wild in claiming things for aviation. The fact of the matter is that a loaded bomber of the present era can't carry enough fuel to fly out much more than 600 or 700 miles from its land base. And 500 miles is a conservative radius about which no battleship-apologist should quibble.

Using this radius, the map shows that *from the Italian mainland,* Gibraltar is in no danger from Italian bombers, nor are the Dardanelles, nor is the Suez Canal. But a glance at Italy's air bases *outside* her mainland shows what her strategy is.

At the tip of the "Italian boot" is Sicily, heavily fortified and alive with air bases for bombers — both sea and land planes. And in the middle of the western Mediterranean is the island of Sardinia, also a base of operations. From either Sicily or Sardinia, Italy's bombers could easily reach Tunisia and Algeria, the French colonial possessions in north Africa. And from Sardinia, as well as mainland Italy — with only the French air bases at Corsica and Berre (near Marseilles) to offer resistance—the Italian warbirds could swoop on great Marseilles.

Moreover, as a result of Mussolini's bargain with the Spanish rebel Franco, Italy is converting Majorca, largest of the Balearic Islands, into a base—from where Italian eggs could drop on Gibraltar.

Now glance at the eastern Mediterranean. Next door to Egypt on the west, and bordering the sea, you find the Italian colony of Libya. On its coast nestles the great air and submarine base at Tobruk, commanded by the famous bearded Italian flyer, Italo Balbo. This base not only threatens Egypt but the Suez Canal.

That is the reason why England is building a new air and fleet base at Alexandria, and why England is so interested in Egyptian politics. Under terms of the present Anglo-Egyptian treaty, the British military occupation of Egypt is theoretically at an end. But —England has the right to convert Alexandria and Port Said into bases, as well as to keep 10,000 troops and 400 airplanes at the Suez Canal.

Now look at the far eastern end of the Mediterranean where, just off the Turkish mainland, lie 14 islands called the Dodecanese. They formerly belonged to Greece. Now they are Italy's. Here, at Rhodes and at Leros, are strategic Italian bases, air and naval.

Here is the "big bad wolf" as far as England, France, Russia and Turkey are concerned. Turkey's Dardanelles are within easy striking distance by plane and submarine. And Turkey, remembering how eager Italy has been ever since the World War to get a foothold

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in Asia Minor, is fortifying her entire coast against the Rhodes menace.

,The menace is just as great the other way, toward Syria and Palestine, controlled respectively by the French and British. Behind all of the turmoil in those two lands lies a big prize—petroleum. The "black gold" of Iraq—necessary both in peace and war. England and France control it; Italy wants it. So behind the propaganda, riots and hill warfare is the fight to control the outlets of the oil pipeline from Iraq—at Tripoli, Syria and at Haifa, Palestine.

There is also an important assignment for planes on Italy's mainland. First, there is the necessity of watching the next-door neighbor, Greece, as well as keeping Albania and Jugo-Slavia under control. Secondly, and more important still, is the watch over Malta—just a speck of an island in the Mediterranean but it looms big in Mussolini's eyes. It is only 15 miles long and 7 miles wide. It is rocky and cannot feed its quarter of a million inhabitants. But it is squarely in the middle of the Mediterranean—half way between Gibraltar and the Suez and also right between Sicily and Africa where they almost touch. All traffic must come by Malta and its tiny Italian neighbor, Pantelleria Island. Whoever controls both islands controls the most important channel between Gibraltar and Suez.

That is why Italy glowers at Malta and the British there glower right back.

Malta is controlled, lock, stock and barrel by the British Navy. Nevertheless, from what I saw of it, it is the last place in the world I would pick for a home in these troubled times. It's too easy to have perpetual jitters in Malta. Aviation has ended its security.

Malta boasts an almost perfect seaport at Valletta. Here are Grand Harbor and Quarantine Harbor—the answer to any old-time admiral's dream—with plenty of deep water, numerous side channels into which even the biggest warships can come for anchorage, a drydock so big it even accommodates the world's largest battleship, Britain's *Hood*, and rocky, protecting citadels on all sides.

Once recently, the bulk of His Majesty's Navy—92 vessels of war—were able to find room in Valletta's capacious harbors. But it was a true sign of the times when the same navy scurried out of there during the Ethiopian crisis. It would have been Italy's first move to send over a bombing fleet and—even if the British fleet was not actually sunk—it would have been beautifully bottled up with wreckage from the towering, ancient citadels which still face the harbors but can no longer guard them.

It is not too much to say that as long as Malta is British, John Bull's fleet has a base from which to control the Mediterranean. With Malta out of business, that sea becomes very much what Il Duce calls it—"Mare Nostrum"—"Our Sea."

Malta revealed itself, on my visit, as a prime example of a place in terror of the air. Our freighter steamed into Grand Harbor past rows of British warships and on the decks of each one were rows of newly installed anti-aircraft guns. Daily, the battlewagons lumbered out to sea for anti-aircraft practice. The war rehearsal even went on by night.

The great old fortresses built around Valletta by the Romans, Arabs, Venetians and Crusaders—each in their period of might—are pretty much a nuisance now but all around them are fortifications, more modern and less visible to the aviator's eye. These guard the drydocks, oiling stations and food wharves. Along the side of Admiralty Hill, flanking Grand Harbor, are row upon row of grotesque oil tanks—each camouflaged with designs calculated to make them look like just so much more sandstone to an enemy flyer.

"Is there a mechanic in the audience?"

As for the Maltese people, they seem truly pro-British even though many are of Italian descent. They appreciate the business which those battlewagons and thousands of British seajacks bring to Valletta. Moreover, they know plenty about the hard times in Italy under Fascist rule.

Because they realize that Malta would be an ideal aviation target, they eagerly cooperate with the various preparedness schemes. The government has begun a "traveling poison-gas chamber" system for educating the people how to care for themselves in time of gas raid. Daily, big trucks tour the island, each carrying a big tank. The Maltese are invited to don a mask and stay in the gas-filled chamber for ten minutes so as to become accustomed to the idea.

Malta is fortunate in another respect. To withstand a siege by the Turks, the Crusader defenders of Malta — the Knights of St. John who made Malta their home and stronghold for two and a half centuries—built most of the fortifications seen today. They also dug hundreds of vaults in the towering sandstone rock around Valletta, in which to store food. These vaults are still used as storehouses for wheat. But they have found another use. The government has prepared to use them as gas-proof chambers in time of air raid.

Without doubt, Malta will be one of the first battlegrounds if international war comes to the Mediterranean. Britain will make every effort to keep the island. Mussolini will be just as eager to seize it—or shatter it to bits. He hasn't the heavy warships with which to challenge Britain.

He will depend on airplanes and submarines. Britain, with an estimated 4,200 planes available for emergency compared with Italy's 3,300, is nevertheless the weaker, aeronautically speaking. Britain's air might will be split up, with portions all over the globe and the bulk warring over the English channel and Europe's mainland. To defend Malta, she will have to rely on her fleet and the island's anti-aircraft devices.

As for the fleet, it is not only heavy with anti-aircraft batteries, but it is daily becoming better equipped for counter-offensive by air. Already, Britain has six aircraft carriers, and she is building five more.

The island itself will help out with its fortifications and a small but fast fleet of pursuit ships of several types—probably 300 in all. A large airdrome has just been completed at the center of the island near the walled city Mdina. In this section she is going ahead with three more airdromes as well as increased infantry, artillery and anti-aircraft strongholds.

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Meanwhile the little island has already proven itself very valuable. Last summer, when modern "pirates" roamed the Mediterranean, Malta became a center of the "anti-piracy" patrol instituted by France and England. Every morning, a fleet of Royal Air Force seaplanes took off from Malta for their daily patrol of the narrows between Sicily and the African coast. They did half of the work. A fleet of cocky little destroyers did the rest. It is significant that no sooner had that patrol begun hovering around the Italian waters off Libya, Pantelleria, Sicily and Sardinia than "pirate" forays ceased in that section.

Italy and England are the chief rivals in the Mediterranean but the picture is more involved than that. There are oth-

ers involved. France, for instance, with an air force of about 3,700 planes of all types—bowing in air might only to Russia and Britain. The big new French rearmament program calls for 1,300 more planes.

But France, like England, cannot spare all her air strength for the Mediterranean. Her best strategy is to split the job with her ally, England. The result is that Britain would probably guard French interests in Syria and the Suez, while France would lend a hand with the watch over Gibraltar.

Last fall, when Italian-sponsored agitation among Arabs in the French colonies of North Africa reached white heat, a fleet of 100 of the newest French warplanes flew down to Algiers for an Armistice Day celebration. But it was no secret that this display's real purpose was to demonstrate to Arab and Riff troublemakers how easily and speedily French bombers could streak down from Marseilles.

It was France, too, who put her foot down on Germany when she heard that the Nazis were sending men into Spanish Morocco to build an air base for Franco. That would have been too near Gibraltar.

Speaking of Germany, there is a power who could spare very few of her warbirds for the Mediterranean. They'd be needed in Europe, with Mussolini taking the Mediterranean end of the job. The best estimates show that Germany has about 3,200 planes of all classes—of which about 45 per cent are bombers, 30 per cent are pursuit and attack ships and the remainder are observation and transport planes. Her asset is this—most of her planes are new. Her air force was built up from scratch in a hurry and does not contain so many old crates as do the air flotillas of her neighbors.

At the far eastern end of the Mediterranean are two snappy new air powers—Russia, whose estimated 5,500 warplanes of all types lead the world in number, and Turkey, with her first goal of 500 brand-new warplanes almost reached.

But Russia's air force is more interested in the European and Asian mainlands—its big menaces are Germany and Japan. As a result, the U.S.S.R. will hope that England and Turkey can keep the Dardanelles open. This in turn will mean that Britain will depend pretty much on Turkey to handle that assignment. And Turkey, with Kemal Ataturk inspiring the nation and with a big mistrust for every Italian move, will certainly prove a thorn in Italy's side.

It would be easy—if the Balkan nations were not the topsy-turvy, unreliable countries they are—to say that Turkey would get help from them, in view of their Balkan Entente agreement to be pals.

In fact, with the exception of Czechoslovakia, all of the Balkan countries have gone pretty much Fascist in the past two years. But that doesn't mean that the Rome-Berlin axis can depend on them either. The Balkans (excepting Czechoslovakia again) have a habit of selling out to the high bidder. Their air strengths line up something like this:

The Czechs are the strongest, with a modern air force of 800 planes and a high morale. However, a general war would find them too busy defending themselves to be interested in much of anything else. Then comes Rumania, lying along Russia's path through the Black Sea to the Mediterranean. She has perhaps 300 planes, many of which were given her by France and Czechoslovakia before she began flirting with Fascism, and she is trying to buy more with profits from her national lotteries. But her army is notoriously corrupt and its chief strength seems to be in flashy uniforms.

Another Balkan that has come under German-Italian domination is Jugoslavia, with about 700 planes and a relatively high morale. The Serbs of Jugoslavia are real fighters. The air forces of Albania and Bulgaria are practically negligible.

As for the Greek air force of about 200 planes, it is as full of internal dissension and capable of revolt as is the Rumanian. Furthermore, a war would likely find Greece in her old and profitable role of neutral.

In Spain, it is extremely unlikely that either side would have enough energy left after the civil war's end to do much in the Mediterranean. But the powers who have befriended whichever faction wins will undoubtedly find enviable bases for air operations in the Hibernian peninsula.

As I have tried to show, the big fight in the Mediterranean, unless Mussolini does some sensational mind-changing, would be between England and Italy, with England on the defensive.

There are many factors, of course, in addition to the actual air strength of each country in numbers. The actual worth of a plane is crucially important. It is no secret, for example, that the Italians are not satisfied entirely with their Fiats and Capronis and are still trying to develop a fool-proof, air-cooled motor; and that the English motors—Bristol, Hawker, Rolls-Royce, etc.,—are probably the best in Europe, with the exception of the American ones found in Russian and Turkish warplanes.

Another fact is that the air strength of each power is constantly increasing and increasing rapidly—even though much of their claims to be building thousands of new planes is bombast aimed at scaring the other fellow.

There is also the matter of a fighting man's actual worth. The Italians, despite Mussolini's truculent words, are not respected throughout Europe as superfighters. Almost any Turk will say he can lick five Italians. Perhaps so; perhaps not. Italy's neighbors have little respect for the trouncing she gave the unarmed Ethiopians of Haile Selassie, and are always ready to taunt Italy with her World War disaster at Caporetto and Spanish war defeat at Brihuega. They do not believe the Italian has "staying power."

END

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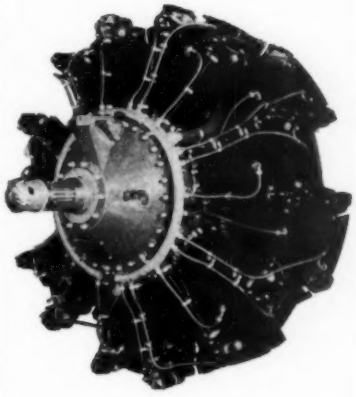

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School Days

(*Continued from page 48*)

pineapple experimental grower, Army officer, musician, packing company official, gas truck driver, rancher, sandwich and fountain man, draftsman and service station attendant.

Immediate objective of most graduatinging students is work with a scheduled airline, although the flying students realize that a far greater flying experience than theirs is required by the airlines of their pilots. Surprisingly, though, there are two men who expect to become airline mechanics to every one who expects to be a pilot.

Next to airline work, the most popular immediate objective is a job as a pilot or a mechanic at a commercial airport. Factory work follows in popularity as an immediate objective although students specify that they seek this work "only to start my career in aviation".

Other graduating students will become aircraft dealers and salesmen, go into business for themselves teaching, others to fly and handle charter trips. Such operations generally will center in the student's "home town" to which he will doubtless return a hero. The remaining students indicate a desire to purchase their own planes for sport flying and to build up flying time for future positions as airline pilots.

Two students list, as their immediate objectives, entrance into the national air forces. These are likely students who without previous flight training would be unable to get into the air services for flying duty.

Asked to list their eventual objectives in the aviation industry as distinguished from their immediate prospects, students showed their preferences thus: Scheduled airline pilots, skilled airplane and engine mechanics, airline maintenance officials, production and other factory executive positions with aircraft manufacturers, Army pilots, engineers and designers, instructors, fixed base operators, and aircraft dealers.

Only a very few students have not completed a high school education. About one-third of the student group have had college training, but most of these completed only two years of college work before deciding that technical aviation training would produce superior results in the long run. Preferred college course was engineering. Only five out of a hundred students are married.

Sixty-five percent of students come from cities of populations less than 20,000; twenty-five percent from cities of 20,000 to 500,000; and only ten percent from cities with populations over 500,000. Geographically the middle-west leads as the student's place of residence; followed by the west, east, northwest, foreign countries and the south, in the order named.

Most funds for enrollment have generally come from parents and from inheritances, although 60 percent of the students have earned part of their tuition and more than ten percent have earned all. One student said frankly that money his wife had earned contributed to his tuition payments.

Better agricultural conditions during 1937, and a similar greater return on investments during that period, have made it possible for parents to contribute financially to the success of their sons' careers. Farming is listed far ahead of other businesses as the family source of income.

About half of the flying students have indicated their intention to purchase planes on the completion of their courses.

END

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Make Your Lightplane Pay

(*Continued from page 13*)

A cemetery development in process of promotion is nearly always a quick sale. Your air picture will help prospective clients decide just where they wish to retire. Real estate developments are another obvious market. Sometimes it pays to explain that, by shooting from the proper angle, you can provide an impression that the lots are within a "five minute drive from the business district". Air pictures are a smart investment for both types of buyers. They could give their salesmen no better means of holding a prospect's attention while they unreel their sales spiel.

Small outlying factories are nearly always sure-fire. Rarely can they afford the $50 or $100 demanded by established aerial photographic concerns. But the owners are not insensible to the attention-getting value of an air picture in advertising and literature. The view will also add dignity to the walls of branch offices.

Now we come to the sand companies, a gold mine which I sadly overlooked during my first year as a free lance, fly-by-night aerial photographer. Sand companies are usually scattered along the same river, and they are keenly concerned over the ever-shifting whimsies of the channel. The value of their investment is at stake. Air pictures tell them how their jetties are handling the situation and whether the operations of a rival plant up the river are prejudicing their own interests. That, at any rate, is the explanation confided to me by one buyer. I had wondered why sand companies seemed so interested in my wares. One outfit, prospecting for advantageous new locations, asked me to shoot ten miles of a river. A 20-minute hop paid $100, of which $95 was clear profit.

To mention a few more groups of quick-cash customers, there are the private plane owners who will usually make it worth your while to shoot them in their ships as you fly alongside. Attractive tourist camps are also ripe prospects. If your country offers scenic attractions, you can find many picture buyers among resort owners and summer visitors. Never pass up summer residences around a lake. The owners are almost sure to come across. Ardent golfers will thank you for selling them a bird's-eye view of their favorite courses so that they may retrace the day's fortunes for the benefit of their friends.

Still, after you have cleaned up this immediate business, don't take off for virgin fields. There remains two five-star sources of revenue. One of them is problematical. The other can't miss.

First, call on the managing editor of the local newspaper that is most interested in building circulation. Sell him, if you can, some of your local shots—but proceed from there to the real purpose of the visit. Suggest the following stunt as a streamlined circulation-builder. You agree to provide, at $10 a shot, air pictures of surrounding small towns, with the provision that they average 20 miles apart. The newspaper capitalizes on the pictures by featuring one each week together with a lengthy history of the pictured town. The paper also offers enlargements of the picture to every new subscriber in that town, and I have known the plan to double the number of subscribers. Where the policy of the paper eschews give-aways, build your sales talk on the obvious value of the stunt in building good-will and prestige.

Lastly, let me outline a fruitful field of activity that is to be found even in localities that have been "shot to death" from the air. Back when wheat sold for two-bits a bushel, I happened onto the fact that the average farmer, if he had any cash at all, would gladly pay a few dollars for a good picture of his home and barnyard. That is, if the picture was already shot and shoved under his nose. Several times I had to accept eggs in payment—farmers did not get government cash in those days—but almost invariably I made a sale.

Now, it is quite possible, with the aid of a film pack adapter, to shoot more than 200 farms from the air in a day. Merely cruise down a road, pop them off on one side, and catch those on the other side on the return trip. Eight by ten inch enlargements will cost less than 50 cents apiece on this volume basis when you gratify a local photographer with the developing and print work. You will be able to sell approximately 80 per cent of the farmers at $2 each. A little basic arithmetic will complete the vista. If you really want to harvest this business with a combine, confine your own activities to farm-shooting and let a crew of salesmen follow up in cars.

The farm views sell for several reasons. For one thing, they provide abou the only way a farmer can get a comprehensive picture of his buildings. Moreover, an air picture will always make a barnyard look more up-to-date than it is. Unpainted buildings appear brightly modern. You can depend upon stirring the owner's pride. But don't stop there. Suggest that the picture would facilitate a sale of the farm to a buyer located in another part of the country. Many a farmer expects to sell out some day. Farmers will also prick up their ears when you point out how the picture highlights his improvements. It is a handy thing to have along when soliciting a loan. Failing in an appeal to his practical nature, play upon the sentimental. Prints would make ideal Christmas mementos to the sons and daughters who now live in the big city.

To engage permanently in this refreshing trade, it is necessary from time to time to hunt new horizons. Those who like an independent livelihood, the joy of dealing in products of their own creation and an utter freedom of movement, will not consider this a hardship.

END

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Q & A

(Continued from page 50)

hazard is concerned, it is about six of one and a half dozen of the other, for with 50 gallons of gas burning, the nature of the structural materials is of little importance.

* * *

A. A. L., Duluth, Minn. I have an examination paper (a sample examination) on meteorology that I have been trying to work out, but I cannot find any answer to one of the questions. This question asks: "Name the four principal cloud forms." Please let me know what these clouds are.

ANSWER. According to the generally accepted standard, the four basic cloud groups are as follows: (1) Stratus, (2) Nimbus, (3) Cumulus, and (4) Cirrus. There are numerous modifications and subclasses that are really combinations of the above four basic clouds.

Among the sub-groups are: Cumulo-Nimbus, the thunder cloud; Strato-Cumulus, long rolls of white cloud; Cirro-Cumulus, the herring type of high cumulus often called "false cirrus," and so forth. There are at least twelve types of recognized cumulus clouds alone which makes long study of clouds a necessity before full acquaintance is had with them.

* * *

C. G. K., Boulder, Colo. Please describe a chronometric tachometer to me and what it is all about. I am acquainted with the good old-fashioned tachometer, but this other job has me dizzy.

ANSWER. This is hard to explain without adding to your dizziness, but I will make a try at it. The chronometric tachometer has a clockwork timing mechanism added to its tachometer group so that the revolutions are counted intermittently during short time intervals and are then added up to complete the whole. These intervals are of from one to two seconds duration, hence the actual reading lags one or two seconds behind the occurrence of the speed noted.

This process is known mathematically as "integration" and is a necessary function for exact measurement of speed or velocity. It is only an approach to the truth, for the intervals should be infinitesimal for exactness. Speed is the rate of motion which calls for an integration of both the time and space elements, which is not accomplished with an ordinary tachometer.

The ordinary direct-driven speedometer is not basically accurate for the same reason. It integrates the space element but not the time element. Chronometric speedometers are made where accuracy is required.

There have been several books written on this subject, starting with the errors of the old bicycle "cyclometers" up to the modern time. Lord Brougham's book, highly mathematical, is a masterpiece on matters relating to velocity and speed.

END

Safe—Sane—Sure

(Continued from page 17)

mittee got home and reported, some of the members hadn't the $60 that each share figured up to. They got around that though, by making the down payments on the shares offset the down payment on the ship and the monthly share payments meet the contract payments. That must have been a happy night. The money was quickly gathered and they drew lots to see which one would go to Long Beach with Naseef to bring her back. Steve Matusek won and early one Saturday morning in April of 1936 they went after her. The next day everybody got a ride and they went to work.

A more widely varied group of men could hardly be imagined. There were factory mechanics from Consolidated, a carpenter well into his forties, a civilian machinist from the North Island Naval Station, a photographer from the same place, an oil prospector, a deputy sheriff—and that's only a few. The youngest member is a kid of 18 that can't drive a car—yet—but has 50 solo hours and is a splendid pilot.

The club was using the Linda Vista Airport on Camp Kearney Mesa, run by Clarence and Grace Prescott—both well known flyers—for sportsmen pilots. It was ideal country for beginners. Flat, not too much brush and there is a big Navy field just across the road for emergencies. It was a long way out though, and it took time to get there but all the 20 were getting instruction as fast as they wanted it. A system of dating was arranged that gave every man his fair share and there was always a little extra. These men were all working and the job had to come first, which made it impossible once in a while for some one to take the time coming to him. Then it was available to some one else.

Thirty-four days after the club got the ship the first man soloed. He was Jerry Hopkins, a wing worker in the Consolidated plant. Jerry took six hours of dual instruction. He's the cautious type and takes it slow and easy. Let's see what it cost him:

When the club bought the *Cub* they were furnished data on the fuel and oil consumption. This indicated a net cost of 50 cents per hour. They decided to double this figure and charge $1.00 per hour for time, praying it would be enough. It was *and always has been.* So Hopkins' total cost for time and instruction up to solo was $6 for the ship and $18 to Naseef for his services. This makes $24. Can you beat that? It's true that his membership cost $60, but that represents an equity in the club property and he still had most of a year to pay for it in. It is transferrable, too, within certain limits. So that's really no more of the cost of learning to fly than a car to take him out to the field would be. And in addition he could build up time at a rate that was only 20 per cent of that of any other local operator.

At first the club had a rather loose organization. They had a constitution and by-laws and the officers had executed the contract with Air Associates. But after a few months it was seen that a more elaborate form of body was needed, so a firm of local attorneys instituted corporation proceedings under California law and some of the holes were tightened up. Naseef was under contract to the club as instructor-operations manager with plenty of authority. He seems always to have used it wisely and fairly, too, and a day came when he needed it.

One of the members was shooting landings all alone on the Navy field on the Mesa. He came in a little low and gunned his motor to get plenty of clearance over the low trees that border it. The motor popped, died and . . . crash! That might well have been the end of the whole club. But it wasn't: these boys had other ideas.

In the member's written report of the accident he blamed it on the motor; said it had been acting up and finally admitted that in violation of written orders grounding the ship if the slightest irregularity is noticed—even though it apparently clears up—he had made another hop. He disclaimed responsibility and forfeited his share. However, the damage had been done and it had to be repaired.

The boys hired a big empty private garage, stripped off the fabric and looked the plane over. The landing gear was washed out; the propeller was broken and a wing tip damaged. A fuselage stringer was bent, too, so they rebuilt her. They borrowed and begged, worked like trojans, wangled and finagled, but when they were done they had a ship better than ever and flew it a total of 1,300 hours.

Along the way a faster, heavier ship became increasingly necessary. A Porterfield was chosen and another 20 memberships issued, payment to be made on the same original basis. Of course these shares were more costly, amounting to $100, but the new members had a share in two ships and the benefit of all the original hard work and experience gained by the first 20. Their memberships, then, were cheap. Dues were being assessed to cover the cost of hangar and field. These only amounted to $1 per month each and did it nicely. But time on the Porterfield was necessarily higher. They set a tentative of $2 per hour and after a month's experience this proved to be adequate.

In April of 1937 the club moved to the municipal airport—Lindbergh Field. The Prescotts had been splendid, but transportation was a problem. Hangar rent was more in the new location and the dues were upped to $2 per month. The old *Cub* had a lot of hours on it, too, so a deal was made to replace it with a later model. A treasury balance on hand was sufficient to meet this cost without any assessments, which proves the club was on a sound financial basis.

A little later 20 more members were

admitted and a Taylorcraft was purchased. This plane has wheel control and was needed to give the men experience on both types. Time on it costs $1.50 per hour and is leaving a nice margin for fixed charges.

Now they have to move again. Traffic is increasing on Lindbergh Field so swiftly that it may constitute a hazard in the future and rather than wait until it does—the club plays it safe—they have taken a long term lease on the old Rose field at Chula Vista.

Right now they are working down there repairing the hangars, grading the runways, adding a room to the dwelling that one of the members will occupy as superintendent and throwing their whole hearts into it. A more enthusiastic group couldn't be imagined. And with reason. Out of the 60 members 54 have soloed. The top man has 300 hours and several others are well into their second hundred, as well. Let's see what it cost:

First, he was well under the club average of five hours' dual. But using that figure, we have the ship costing him $5 and instruction $15 more, or $20. To date he has 130 hours on the *Cub* at $1 per hour. That makes a total of $150; 34 hours on the Taylorcraft at $1.50 amounts to $51 more to make $201; 139 hours on the Porterfield at $2 per hour comes to $278, which adds up to $479. Next are the items of membership cost, $60, advanced instruction (estimated) of 10 hours or $30 and club dues over a period of two years of $30. This makes a grand total of $600 for 303 hours flying—just a little over $1.87 per hour for everything — instruction, time—and he owns an equity in three airplanes. Just compare this figure with local operators rates for time after solo of: Cub, $4; Kinner, $8; Great Lakes, $8; Fleet, $8 per hour and up.

The club ships have flown over 2,500 hours. Not a single member has ever received a scratch and most significant, nearly all are men who could never have learned to fly in any other way under the sun. They simply didn't have the money. The ships are kept in the pink of condition by licensed mechanics and when you talk to some of the younger fellows—earning little—and see the look of pride that comes into their eyes when they show you the ships or pull the chocks to taxi down the apron to the runway, you know how much it's meant to them—a dream come true.

END

How to Rig a Light Biplane

(*Continued from page 60*)

bringing the top wing back so that it can be rolled some more.

If, on the other hand, we get the incidence but are short on stagger we can shorten the diagonal and bring the top wing out or we can run both the front and rear struts out and roll the wing still further. If the chord of the upper and lower wing are the same changing the front and rear strut the same number of turns in the same direction does not change the boxing of the wings.

If you have too much stagger and not enough incidence tighten the rear flying wires which brings the trailing edges down and the top wing back. On most ships you are allowed up to ¼ inch error from tip to tip on the stagger. The whole thing is just a matter of juggling between the incidence and the stagger. Once you see the simple mechanics that rules the movements of the wings the whole thing is simple.

When you have the stagger and incidence to your liking, bring all the other wires up to the proper tension and streamline them. Check all operations again, all struts to see that you haven't run them out too far for safety and secure all bolts and lock nuts.

All the ailerons should ride about an eighth of an inch high when in the air, they are more effective this way and you get better control at the stall and landing. The reason is this, ordinarily the tip will stall before the rest of the wing because of the tip losses. If the aileron rides high it causes the tip to stall later than the rest of the wing giving aileron control up to the very last.

Don't rig any wash in into your ship to correct for torque. It isn't necessary. That is cared for automatically. The slipstream doesn't flow back in a straight line, it has a corkscrew shape. This slipstream hits the top side of one wing and the bottom of the other wing thereby offsetting the effect of the prop. However, though, you should still offset the fin to prevent turning of the ship.

Suppose that the first flight shows the ship to be left wing heavy. Tighten up a half turn on the rear flying wires on the heavy side and loosen the rear landing wire on the same side. A full turn may be necessary. If more than two full turns are necessary the entire ship should be rechecked.

If a re-rig doesn't do any good you may get results by the addition of tabs on the upper ailerons. These tabs should be about ten inches long and one and a half inches wide. If your ship is a small one you may find a smaller tab to be sufficient. Always move the tab in the direction you want the wing to move and remember, you don't have to move the tab but a small amount to get results.

Now, here is something to remember in landing. If you throttle your motor completely back it slows down the flow of air that passes through it. Now quite a few feet of wing area is covered by the slipstream and if the flow of air is slowed down over that amount of wing the result is an increase in the landing speed. So if you keep the engine turning up a little just enough to not retard the flow of air you will get the full benefit of the area swept by that air.

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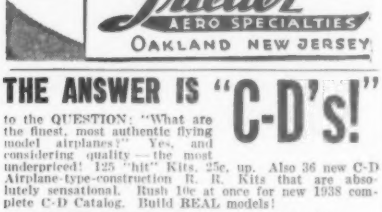

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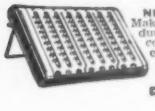

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Rowdy Pilot

(*Continued from page 62*)

"'You were okay the first day,' they told me, 'but you've sure got lousy lately.'"

A gangling, 16-year-old cowboy saw his first airplane one afternoon while gawking around the county fair at Fresno, California. A barnstorming pilot was thrilling the natives, including Frank Clarke (the cowboy) with flying exhibitions that consisted of landings and take-offs from the infield of the fairground race track.

The climax came when the plane raced an automobile around the track—and the airplane nearly won!

That was the cue for a checkered and salty career to begin for Frank, who was born with a dread of peace and quiet for himself or anyone around him.

Inevitably, he landed in Hollywood, where his reckless courage found ready sale to the makers of the first two-reel thrillers. He earned the money to complete his flying education by the simple—to him!—expedient of hiring out for stunts like plane changing, hanging from the tail-skid of a Jenny, perching on the fuselage and flying with ropes and diving old crates into the ocean.

One of his reckless feats has never been duplicated, even in this day of powerful airplanes. He flew a slow, rickety old Canuck from the top of a 12-story building under construction in downtown Los Angeles.

The stunt was done, Clarke recalls, in defiance of the police department, owners of the building and even of the studio for which the scene was made.

"We got 'em to let us hoist the plane up there," Clarke explains, "after the director and I both swore we were just going to shoot the set-up and the background, and then fake the actual take-off.

"We did all that—and then I climbed in and flew away!"

Witnesses aver that it wasn't as simple as that. They claim that Clarke, after the very short take-off run allowed by the narrow roof, "mushed" downward more than half the distance to the busy street before getting up enough speed to just "fly away."

Win, lose or draw—you rode your plane down in those days because there weren't any parachutes. Today, of course, 'chutes must be worn for all stunt flying.

Home airport for the movie pilots in the old days was at Venice, a beach community some 20 miles from Hollywood. It was here that Clarke earned the reputation of a "rowdy so-and-so" whose most innocent action aroused suspicion of impending horseplay.

A lariat, a funeral wreath and a home-built airplane with wings curved like a bird's brought him to grief on one occasion.

Frank still loved to twirl his lariat in those days not so far removed from his cowboy livelihood. Picture the circumstances:

Clarke, Frank Tomick and one "Mope" Moltrup had been engaged to drop flowers over a funeral one morning. When they returned to the field one handsome wreath remained. Clarke hung it on a hangar door.

An Ocean Park druggist had gone to the sea gulls for inspiration and built an airplane. It turned out to be an aeronautical atrocity, curved wings and all, that no one could be pursuaded to fly.

This plane was behind the door bearing the wreath.

Clarke twirled his lariat idly and wondered aloud and at sarcastic length why no one, especially certain "hot" pilots within hearing, had nerve enough to fly the atrocity.

He gleefully spurred the resulting argument until the three were drawing straws—the loser to "test" the man-made bird. Moltrup was the short-ender. The history of the next few minutes is vivid on the annals of the old Venice airport.

The weird-looking plane was wheeled to the end of the runway by the all too willing winners of the lottery. Moltrup crawled dubiously into the cockpit and prepared to take-off down the field past the row of hangars.

"We went back down the line to where he figured he'd stop taxying," Clarke describes the event. "We never dreamed he'd get the damned thing off the ground."

Waiting for the unlucky pilot to warm up the dodo's motor, Clarke fiddled with his lariat. Tomick picked up the wreath and started to hang it back on the hangar door. Suddenly they heard the home-made plane's motor roar.

"I'm a son-of-a-gun if Mope didn't get that crate about four feet off the ground," Clarke says, "but that's as high as she'd go.

"Tomick and I laughed like hell at the way the thing was waddling along when all of a sudden Tomick let go with that wreath—and scored a ringer on Mope! I tossed my rope, caught onto a wingtip and hung on. . . .

"That overgrown kite went into the damnedest gilhooley you ever saw!"

Frank is strangely silent on what Moltrup said when he crawled out of the wreckage, unhurt but carrying the remains of a funeral wreath about his ears, and learned who had caused him to pile up the druggist's plaything.

The druggist?

"We told him the wind blew his plane away," Frank shrugs.

No one ever accused Clarke of conservatism in those wild days. Witness his taste in pets.

Frank's pride and joy was a rattlesnake!

He called it "Pedro" and gave it the run of his ship. Friends knew it had been de-fanged but strangers, especially the small boys who were the bane of the airport, found it unnerving to be

confronted by a three-foot rattler when they prowled about Clarke's airplane!

"The kids' mothers used to come to the airport and threaten to have me arrested," Clarke says. "I just told 'em they oughta keep their kids outa my plane."

Pedro usually stayed in the rear cockpit or under the floorboards when Clarke was hopping passengers. Once he double-crossed the pilot and created another chapter in the Clarke saga.

Frank sold a hop to a passenger who was more than slightly inebriated—and Pedro had to choose that occasion to wriggle forward and coil companionably between the passenger's feet!

You can believe it or not—Frank's intimates have their doubts—but Clarke swears that he had nothing to do with the snake's migration.

"The first thing I knew," he declares solemnly, "this guy starts climbing out of the plane. He went stark, staring nuts!

"I made a wild grab and got a handful of coat-tail, hollering at him to get back in the cockpit. I guess he didn't hear me—he kept trying to get further out on the wing, so I twisted his coat around a strut and hung on.

"It was a hell of a mess!

"The guy had one foot on the seat and the other over the side. Every time he'd look back into the plane he would tug harder to get loose and wave his arms and holler.

"I was stuck, hanging onta a coat-tail wrapped around a strut with one hand and trying to fly with the other.

"We landed that way. When the plane slowed down and I let loose the drunk put 50 yards between him and the plane in about three jumps, fairly screaming that there was a rattler in my ship!

"I looked up front and saw Pedro's tail just disappearing under the floorboards. Then I tumbled to what had happened. Trying to keep a straight face, I walked over to talk to the poor fellow. He was scared silly, but I finally persuaded him to come back to the plane and show me the snake.

"Of course Pedro was out of sight. My passenger searched the plane looking for the rattler—and I looked at the guy pityingly.

"I guess he thought he had 'em—he sure walked away from there with a belly full of butterflies!"

Only one of Frank's madcap adventures ended in tragedy, and that was through no fault of his own.

An Indian chief in full regalia stalked majestically onto the airport one day and asked for "Mr. Clarke." The Chief had thick, black hair in twin braids more than a foot long.

"I can hang by my hair for more than an hour," the Indian announced solemnly, "and I thought it might get me a little publicity if I did it hanging from an airplane."

Nothing sounded crazy to Clarke, but . . .

"How do I know you can do it?" asked Frank.

"I'll show you," was the answer and with Frank's help the Chief tied a rope to his braids, threw it over a hangar beam and hung there unperturbed.

Frank gazed admiringly—until someone beckoned from an adjoining hangar.

A pair of dice were clicking. Clarke succumbed to temptation and forgot his Indian friend—until a piercing scream broke up the crap game!

"Nothing had happened," according to Frank. "A couple of women strolling down the field chanced to glance into the hangar and saw a man hanging there . . . swaying back and forth . . ."

When the uproar subsided Frank called several newsreel companies and told them about his "find". The stunt was a spectacular success. Frank flew all over Los Angeles with the Chief dangling below the ship by his braids and two newsreel planes circling about.

"The Chief got his publicity," says Clarke. "Newspapers wrote editorials saying he belonged in an asylum."

(In recent years, Clarke has confined himself to the type of stunting air race crowds and movie audiences dote on. He has flown at several of the recent National Air Races and currently has his hands full with Hollywood's return to aviation films. The film in which Clarke now stars—but isn't seen—is Paramount's "Men With Wings"—The Editors.)

After the hullabaloo quieted Frank forgot the whole affair—until he got a letter from a hair restorer concern inquiring if the stunt was on the level and could the Chief do it again.

"They wanted us to put on the stunt all over the country, with the Indian signing testimonials giving the company's hair dope full credit for his strong locks.

"I hunted up the Chief and we both thought we were going to make a pile of money. Then, while we were waiting for the last details to be ironed out, the Chief got another of his dizzy ideas and I, like a chump, fell in with him."

The Indian's idea, Clarke explained, was to jump from an airplane with ten balloon parachutes rigged so they'd open in succession. The first would open when he jumped. Then the Chief, armed with a sharp knife, would cut that 'chute loose and it would pull the second 'chute free; then the third; then the fourth—and the Chief would sail to earth in the first "chain parachute jump" ever attempted!

His 'chutes worked perfectly but his timing was bad—he rode each one too long, cut the sixth loose only a hundred feet from the earth and fell to his death, still wearing four parachutes, before the sixth could open!

That tragic incident spelled the beginning of the end for Clarke's career as a scapegrace of the air. Of late years he is less inclined to reckless abandon—with only occasional minor lapses.

Frank got married about three years ago. The beautiful and charming Mrs. Clarke is known to frown upon her husband's roughneck tendencies. There hasn't been a typical Clarke outbreak for about three years now. . . .

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IS AMERICA VULNERABLE TO AIR ATTACK?

Lieut. A. G. J. Whitehouse, prominent ex-World War pilot and aviation writer, answers the potent question asked by famed explorer Harrison Forman on page 18 of this issue: "Will Enemy Bombers Darken Our Skies?" Lieutenant Whitehouse graphically presents the other side of this grave topic. Unbiased readers owe it to themselves to read this and . . .

OTHER FEATURES

★ **The huge July issue will, in addition to the above outstanding article, contain dozens of exclusive features dealing with every phase of American and international aviation. For instance, there will be "Why They Jump", dealing with the facts behind emergency parachute jumps; another brilliant article by Major-General James E. Fechet, "The Modern Turk Wears Wings" and a score of others.**

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Air Corps Schools

(*Continued from page 62*)

COMMAND AND GENERAL STAFF SCHOOL

Of the total of 237 officers who graduated from the Command and General Staff School, Fort Leavenworth, Kansas, on June 21, 1937, 38 were members of the Air Corps.

ARMY INDUSTRIAL COLLEGE

Ten Air Corps officers were included among the 95 students graduating from the Army Industrial College, Washington, D. C., on June 23rd.

SCHOOL OF AVIATION MEDICINE

Five officers of the Medical Corps, U. S. Army, and one Medical Reserve officer, who pursued the course of instruction at the School of Aviation Medicine, Randolph Field, Texas, graduated on March 31, 1937, as Flight Surgeons.

Another routine course of instruction to qualify medical officers for duty as Flight Surgeons was commenced at the School of Aviation Medicine, Randolph Field, on July 15th, with 11 students enrolled. These students graduated on November 13th as Flight Surgeons.

AVIATION ORDNANCE

A School of Aviation Ordnance was started at Langley Field, Va., with Captain Edward P. Mechling, Ordnance Dept., as Director, for the purpose of instructing Air Corps enlisted men in subjects dealing directly with aviation ordnance, such as theoretical and practical training in the storage of bombs, fuses, pyrotechnics, small arms ammunition and machine guns. Three sessions are to be held each year, beginning in October, January and March.

AIR BASE TECHNICAL SCHOOL

On July 1st, the Air Base Technical School at Langley Field, Va., opened its doors with a class of 15 men, an increment of 15 additional men being added every 15 days, and two months being allotted each class for the completion of the course, same covering basic subjects, such as shop mathematics, mechanical drawing, blueprint reading, elements of electricity, elements of metal work and radio code, so as to prepare men taking the course for the Chanute Field entrance examination.

SCHOOL FOR INSTRUMENT LANDING TRAINING

Three officers and six enlisted men reported at Wright Field, Dayton, Ohio, October 4th, to receive instruction in the standard Air Corps instrument landing system. Classes for officers extend over a two-week period, with three officers to a class. Those for enlisted men extend over a period of one month, with six men to a class.

EDITOR'S NOTE. While many men are being trained as indicated in this article, it would seem that the ultimate supply for massed operations will be supplied from the semi-civilian organizations such as the reserve training corps and to that end, the government should provide the necessary supplies and equipment to these corps before the demand becomes actual.

Swanee Taylor

(*Continued from page 48*)

gress had better increase the army, or navy, immediately and step him up in rank accordingly.

Now this department is wide out for adequate national defense. We must have a navy and an air corps second to none. But, we have to strangle the one or two brass hats in military circles who are trying to scare the people to death.

All of these secret naval maneuvers, for example, are a little silly. Also the spy scares that go hand-in-hand with jingoism. They rarely catch a real spy, and I strongly suspect that whenever they grab some poor wretch and start bawling "spy" that there is a very selfish motive behind it all. Just a sham to give an excuse for secret maneuvers and other such shilly-shally. The taxpayers (and gosh how we are paying) have a right to know, through the medium of the press, exactly what goes on, how much money is being spent and why.

Some Scud . . .

Walter Winchell, writing about "Magazine Features That Wouldn't Be Missed," very aptly says, "Practically everybody but the mag editors realize that aviation is here to stay. In all fiction a flyer whizzing a mail plane from here to Boston is pictured as more daring than C. Columbus. As a matter of fact he is taking no more chance than Granny takes when she skips to the corner for a new package of vermouth . . ." Commander "Rosey" Rosendahl, of dirigible fame, soon goes back to sea-duty with the fleet. Read his book on the big pigs if you want a thrilling yarn of utter devotion to a hopeless cause and heart-breaking effort to prove that cause's worth. Scribners publishes it. . . . There is absolutely no truth to the rumor that they are going to call the Newark-Washington service the Pneumonia Division of the Great Silver Fleet. It isn't cold in the ships if you wear red flannels and keep your overcoat on.

That was pretty peculiar arithmetic Admiral A. B. Cook dished up to the House Naval Committee. He said that 6,750 airplanes would be needed to equal the firing power of 15 battleships. The battleships would cost a mere billion whereas the airplanes would run close to eight billions. So far so good. But the admiral, for reasons best known to himself failed to talk about the high flexibility of aircraft operations which more than makes up the difference in "firing power." Of course if Admiral Cook's tactics are to have our naval aircraft sit down on the water and shoot it out with an enemy fleet that's altogether different. We'd better buy battleships. . . . The whistle is about to blow, and I gotta go. Take good care of yourselves. And remember, all the good flyers die young. Don't ever get "good" in your own estimation; if you do, you won't live to tell your grandchildren all about it.

END

Under the Hood

(*Continued from page 45*)

Tex fully expected to win the aerobatics competition at Paris this spring but it was cancelled because of the tense international situation. . . . Tex is not conceited, but he based his hopes on the Paris rules which required that the two finalists should exchange ships after giving exhibitions in the planes they knew well. . . . Alex Papana, the Roumanian stunt artist who was so good in the *Jungmeister*, tried to fly Tex's Ryan and nearly spun in with it. . . . Papana said: "Tex, take that Ryan over and you'll win easily. Nobody but you could fly it there."

* * *

An item of interest concerning the British Royal Air Force is the order put out by the air ministry directing pilots of the new *Blenheim* bombers (two Bristol *Mercury* engines), to stay out of clouds with them. . . . It seems that the *Blenheim*, which is supposed to have a top of 280 m.p.h. and a range of 1,000 miles, is so unstable that instrument flying with the ship is virtually impossible. . . . All the *Blenheims* now in service are being sent back for modification.

* * *

The summer's air race season is almost on us, so dope on the races and on probable entries, both pilots and airplanes, is timely. . . . No airplane entered in the Bendix trophy race from Los Angeles to Cleveland will be eligible for entry in the Greve or Thompson Trophy closed course races. . . . The Thompson this year has been raised from 200 to 300 miles around a quadrangular 10-mile course. . . . The Greve race will be 200 miles round the same course. Also the distances for these races will remain the same for the 1939 nationals.

* * *

Recapitulation on men and machines: Steve Wittman has two ships, his Wittman Special, 250 h.p. Menasco (the same airplane had the four-cylinder 150 h.p. Menasco last year) and his heavier Oshkosh Chief with a 700 h.p. Curtiss *Conqueror* (he had a D-12 in this machine last year) . . . Art Chester also has two ships, one his *Jeep* with a Menasco 150 h.p. engine, and the other a new midwing, retractable undercart job with a 250 h.p. Menasco Six. . . . Earl Ortman will be flying his Keith-Ryder, 1,100 h.p. Twin-Row *Wasp*.

Roscoe Turner will fly his Turner-Laird with a new Twin-Hornet engine of 1,400 h.p. . . . Joe Jacobson of Kansas City, will fly a new Folkert's Special (250 h.p. Menasco Six) . . . Harry Crosby, who is 1½ inches shorter than during his appearance in the 1936 nationals at Los Angeles (due to back injuries sustained in an almost fatal crackup) has a new ship. . . . At this writing he's had 20 minutes time on it and damaged it in making the one landing on Burbank airport's perfect cement runways.

* * *

We may see some very interesting competition this summer between Seversky and Curtiss pursuit planes. . . . The Curtiss folks, burned up over the newspaper publicity Alex Seversky has gained, are considering the entering of one of their P-36 Army pursuit jobs in the Bendix race. . . . Seversky will be represented by Frank Fuller who won it last year, and perhaps by his own entry of his latest and fastest pursuiter design.

Paul Mantz, motion picture pilot and the immortal Amelia's mechanic, has entered the Bendix race with a rebuilt Lockheed *Orion* (Wright *Cyclone*). . . . It'll be a flying gas tank. . . . A wealthy private owner of a Lockheed "14" (two G-102 *Cyclones* and a cruising speed of 265 m.p.h.) may enter the Bendix also.

* * *

POTPOURRI: Douglas Aircraft is building a new bomber for the Army Air Corps and the DC-4 is the commercial version of this craft. It's supposed to have an 8,000 mile range with a 10,000-pound bomb load. It also has a nose wheel. Of course it's a secret project and the Douglas people can't talk about it because they've sworn to secrecy. . . .

Word comes from the Air Corps at Wright Field that the second Bell bi-engined pursuit plane will have a top speed of more than 400 m.p.h. instead of the 375 m.p.h. wanted at first. . . .

The guns on the Northrop A-17 attack planes converge at a point 1000 yards ahead of the ship when it is flying 75 feet off the ground. . . .

The Wright Aeronautical Corporation soon is to put on the market an extremely high performance sleeve-valve engine. Word seeps out that this motor is almost as economical as a Diesel engine and gives extraordinarily high horsepower for piston displacement. . . .

Paul Mantz came as close to killing himself as he ever will without missing on Friday, April 28, when he dove a Boeing P-12 fighter to within six inches of the ground during exhibition before motion picture and newspaper representatives. His pull-out of the dive was too abrupt and the plane mushed so badly it looked for a moment as if he was gone.

Betting commissioners now concede that the Douglas DC-4 will be flying before Boeing's 307, but that TWA and perhaps American Airlines will have 307s in service late this year while the first DC-4s will not be out until 1940.

Of the four responses made thus far to Pan American Airways corporation on their bid for a super-airliner, one has been a preliminary set-up for a landplane, the others all have been flying boats. . . . In each case the designers have specified that the machines should be modified flying wings. . . . Let us remind you that The Man Under the Hood predicted two months ago that the plane finally accepted and built under Pan American's specifications would be a flying wing weighing between 175,000 and 225,000 pounds.

Glenn Martin refused to bid for the contract because he lost so much money turning out the Martin "130" ocean clippers now used on the trans-Pacific route. . . . Boeing Aircraft is also losing a gold mine turning out the "314" ocean clippers. . . .

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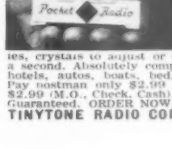

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Air Board

(Continued from page 60)

With the preliminary discussion of the airport problem out of the way, National Air Board members and guests took active part in the arguments that followed:

Captain Depew insisted that only six cities in the United States are now really equipped to handle the new super-airliners. He added, however, that the huge ocean liners of the "prestige" type never have paid their way and, bearing this in mind, similar considerations should finally limit the size of commercial aircraft.

Earl Southee offered the advice that air transport companies dig out the land grant bills under which so much valuable property was transferred to the railroads in the early days. Mr. Southee also expressed the opinion that the difficulties in connection with "hot"-landing aircraft were somewhat exaggerated. It was pointed out that huge aircraft have been landed on Elmira, N. Y.'s 30-acre airport with little difficulty. It also is a well-known fact that the Army's huge *Flying Fortresses* are surprisingly slow-landing.

Ray Quick, however, offered the counter-opinion that getting a large transport into small fields with even a little difficulty was not sufficient. He believes in 100 per cent regularity and safety.

E. Burke Wilford believes it is not the landing but the length of take-off which is important at all airports. He suggested "assisted" take-offs, using rail-car catapults or some device similar.

On the other hand, Franklin T. Kurt advocated the use of "strip" landing fields to aid the private flyer.

Dean Saville of New York University advised the aviation industry to stand behind the Bureau of Air Commerce and not attempt to seek aid from a multiplicity of government agencies.

It would seem that the airlines are likely to encounter the same opposition from the state boards of aviation as did the railways in respect to special state laws until the Interstate Commerce Commission was organized. The state and Federal bodies frequently clash when it comes to transportation regulations of any kind.

Among prominent guests who attended this meeting of the National Air Board were, besides Mr. Mulligan, Mr. Brun of Air France, the national French airline; Dean Saville, N. Heath McDowell of Pan American Airways, A. J. Gariepy of American Airlines, W. D. Guthrie of the Roosevelt Field School of Aviation, W. M. Wherry, a member of the New York bar; Commander J. D. Sullivan and Leonard Jarden, both of the Bureau of Air Commerce, and Franklin Kurt, prominent sportsman pilot.

END

Enemy Bombers

(Continued from page 19)

submarines would be instructed not to attack the enemy, but merely to radio our High Command the strength and disposition of the various component elements of the hostile armada, such as, how many battleships, cruisers, destroyers, submarines and aircraft carriers, and number of auxiliary craft—the troop ships, supplies, fuel and repair vessels. Our submarines would follow the enemy at a safe distance and keep the High Command informed of its course and speed.

The collective speed of the enemy would be no faster than the slowest member of its train. And even though the auxiliary vessels might have individual speeds of twenty knots or more, because of the necessity of arranging and rearranging the protecting screens of cruisers and destroyers by night and day.

Our scouting craft and aircraft from our carriers would swarm about the enemy. Speedy destroyers and submarines would hurl themselves at the line hoping to pierce the convoy screen of protecting warships and torpedo a troop ship or aircraft carrier before being martyred. Squadrons of our heavy bombers would single out the enemy carriers and attempt to sink or at least disable them for flying purposes.

The harrassment would continue without abatement; and if it did no more than slow up and disturb the organized advance of the enemy, it should still be worth while.

In the meantime, our admiral in command would concentrate the bulk of his forces and proceed to maneuver the enemy into a disadvantageous position; or, perhaps, even to engage him in a decisive naval battle. This he can readily afford, since our Navy is at least equal to Japan's (based upon existing modern "under-age" tonnages). And, it is reasonable to expect that in such an engagement we should be able to inflict as many casualties upon the enemy as he does upon us.

Which, of course, resolves itself simply to this:

An offensive Power would require a Navy far superior to that of our own, possibly twice as large, to be prepared for a heavy loss of war vessels in a major engagement with our Navy and yet have a sufficient remaining number to push on with the attack upon our shores, land troops and keep open the sea lines of communication back to the Mother country.

So, perhaps, it may not seem so paradoxical for our naval leaders to insist that a strong Navy means security and peace to the United States. And, though the danger of a surprise attack by a squadron or two—not a "vast horde"—of enemy bombers upon our seaboard cities still exists, this danger is not sufficient for us to strap gas-masks with our children's school books, build bomb-proof shelters, or hang a uniform in every able-bodied man's wardrobe closet, as our friends across the sea find it necessary to do.

END

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